STOCKPILE AND ACCESSIBILITY OF STRATEGIC AND CRITICAL MATERIALS TO THE UNITED STATES IN TIME OF WAR

HEARING

BEFORE THE

SPECIAL SUBCOMMITTEE ON MINERALS, MATERIALS, AND FUELS ECONOMICS

OF THE

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

UNITED STATES SENATE

EIGHTY-THIRD CONGRESS

SECOND SESSION

PURSUANT TO

S. Res. 143

A RESOLUTION TO INVESTIGATE THE ACCESSIBILITY AND AVAILABILITY OF SUPPLIES OF CRITICAL RAW MATERIALS

PART 8

Staff Study of the Paley Commission Report

APRIL 9, 1954

Printed for the use of the Committee on Interior and Insular Affairs

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STOCKPILE AND ACCESSIBILITY OF STRATEGIC AND CRITICAL MATERIALS TO THE UNITED STATES IN TIME OF WAR

APRIL 9, 1954

UNITED STATES SENATE,
SUBCOMMITTEE ON MINERALS,
MATERIALS, AND FUELS ECONOMICS,
OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D. C.

The subcommittee met at 10 a. m., Senator George W. Malone presiding.

Present: Senators George W. Malone (presiding), Henry Dworshak, and Frank A. Barrett.

Also present: Jerome Adlerman, subcommittee chief counsel, and George Holderer, subcommittee staff engineer.

PURPOSE OF THE HEARING

Senator MALONE. We have convened today particularly, to hear Mr. William S. Paley and Dr. Edward S. Mason. Mr. Paley was Chairman of the President's Materials Policy Commission. Its report is entitled "Resources for Freedom." Dr. Edward S. Mason was one of the commissioners. This report was submitted to the President in June 1952. We are very glad to have you two gentlemen here this morning.

Mr. Paley, we have watched your work with the Columbia Broadcasting System for a considerable time and we think you are doing good work for your broadcasting system. We are more or less familiar with Dr. Mason's work. We are interested in your report, also in the Bell report and these other reports that have contributed to the sum total of human knowledge on the matter of available resources, because Senate Resolution 143 passed in the closing days of the first session of the 83d Congress, directed this committee to hold hearings and study the situation in regard to the availability of critical materials to this Nation in time of war and for our expanding economy and for the security of the Nation and report to the Senate.

Now your report, the report of the President's Materials Policy Commission, has been read and studied by the committee staff with a great deal of interest, a rather exhaustive study has been made of this report and we will make it a part of this hearing.

Your testimony, naturally, will clear up some of the points that are still a little doubtful in our minds as to just what was meant by some parts of the report. The testimony of you two gentlemen will be an important part of this committee's study.

The Commission's report has had wide coverage and has been regarded as an authoritative text and a guide to United States mineral policy.

We have even found that this report has been incorporated in one of the textbooks used at West Point for the instruction of our military men.

I have a half dozen appointees of my own over there and I am personally interested in what they are studying. We have a very congenial President who started at West Point in exactly the same manner as the boys that the Senators and Congressmen are now appointing each year so that your study will have a very vital effect on the future of our country.

Now, to the report, I want to say that there are many parts of the report that the subcommittee and the staff study support. There are many facts and much material with which we are in hearty agreement and with which we take no issue.

UNEXPLORED AREAS OF THE UNITED STATES

For example, on page 8 in chapter 3 of volume 1, you show that the United States, even today, makes practical use of only a small fraction of its total resources.

There never was a truer word spoken. It is a wonderful statement. Your report urges the encouragement of improved geophysical and geochemical discovery methods for the discovery of hidden ore bodies. There have been great advances in that field as you men know, of course, from your study. It is the opinion of many of us who have been in the engineering business for many years that we have only started in that field, it is only beginning.

You also encourage the full use of our known resources and the use of our lower grade resources. You urge that we further encourage finding work for our present unemployed resources which we have heretofore not known how to use. We are studying that field particularly and recommending additional studies where they seem to be needed. We have in mind zirconium and titanium. These metals have been known to engineers for many years but there never was any emergency or extreme necessity for their use and therefore there never were finances available to really develop their full use. But take zirconium, it was necessary suddenly when the atomic program came along to develop our zirconium resources. Zirconium alloys such as zirconium boride may be the answer for gas turbine blades as it retains its strength at high temperatures.

Therefore, suddenly the Bureau of Mines became interested in it and a zirconium plant was established in Oregon which was very successful and certain private organizations were also commissioned to make technical studies.

History so far shows that whenever there is enough need so that the money is available the scientists and engineers keep pace with the needs and in this jet engine, of course, higher heat was generated. It was necessary, therefore, that zirconium alloys for that particular use be developed to take the place of the metals that would not stand such high temperatures.

I have in mind titanium. Now we are making about 2,000 tons of titanium a year. Evidence before this committee shows that we can

use about 150,000 tons annually in our planes and guided missiles. It is necessary or it seems to be from the testimony we have received for a bomber to be effective and to have a reasonable chance of getting through for it to travel eight or nine hundred miles an hour. At this speed the aluminum covering of the plane begins to fail. Above sonic speeds titanium will take the heat.

Titanium is also a possible substitute or replacement for several materials in jet engines where its properties are necessary.

There is a group of materials that have been studied by our staff and by the engineers that we have available, including molybdenum, tungsten, titanium, Columbium and other metals that to a certain extent are interchangeable and all play a vital role in making our Air Force the best Air Force in the world. You get into very technical problems. It was necessary for this committee to hear the makers of the planes, Mr. Douglas, of Douglas Aircraft; Robert Gross, of Lockheed, and many others that really know what they have to have. Also we had available to us General Metzger, of Wright Field, who is right in the middle of allocating very scarce materials for these high speed uses.

So your recommendations, on page 8 of chapter 3 of volume 1, certainly met with the approval of our committee and naturally the world has moved quite a little bit in this direction since you rendered your report. I think you did a service there. The report further recommended substituting new materials, learning how to shift from scarce materials to the more abundant ones.

SUBSTITUTES FOR KNOWN MATERIALS

You encourage the use of substitutes. It has developed that some substitutes are superior to some of the materials which have been used. When you get into that field and get into a substitute you may never go back. Of course, over the 30 years I have been in the engineering business, I have seen that happen a good many times. It has happened in the replacement of copper by aluminum where it was found aluminum is even more satisfactory.

Another recommendation in the Commission's report which we found of interest was that a more determined effort be made to recover scrap.

There has been a terrific waste in scrap. I think testimony before this committee showed as much as 30 or 40 percent waste in titanium. They are unable to utilize this scrap like they do scrap steel. You just throw steel scrap in and make good steel out of it but the scrap titanium was another thing. They think they are on the way now to whipping that situation.

Many informed engineers and mining men with practical production experience have taken very sharp issue with some of the premises, conclusions and recommendations in the President's Materials Policy Commission's report. Due to the voluminous material covered in the five volumes—I have been in the engineering business 30 years and it was a monumental undertaking—it will not be feasible in the space of time allocated to the subcommittee to cover every phase of the Commission's report at this hearing.

Therefore, we will touch only on some of the principal areas where the intent of the report is not clear or where issue is taken with the

Commission's report. We hope that by doing that and having you gentlemen here, that it will clarify the meaning of some of the recommendations in the report.

Mr. Paley, we have called on you first because you were the Chairman of the Commission and, therefore, the one to whom we must look to understand more thoroughly the objectives and the meaning of the report and, of course, you have a certain responsibility in that regard. We asked Dr. Mason to be here with you because we understand that many areas of the report that this hearing will cover are especially within Dr. Mason's field.

Mr. Paley, first—of course, we want you to identify yourself for the purpose of the record.

I might say, we know you principally as a famous radio and television executive. We would like you to give us your background and previous experience in the field covered by the report and tell us how you came to be selected for the job as Chairman of the Commission.

STATEMENT OF WILLIAM S. PALEY, CHAIRMAN, PRESIDENT'S MATERIALS POLICY COMMISSION

Mr. PALEY. My name is William S. Paley. I am chairman of the board of the Columbia Broadcasting System. I acted as Chairman of the President's Materials Policy Commission, which was operating between January 1951 and June 1952.

Senator, did you want me to address myself to the question as to how I came to be selected for this job?

Senator MALONE. Yes, and your previous experience in the field covered by the report.

BACKGROUND AND EXPERIENCE OF MR. PALEY

Mr. PALEY. I have had no experience in the field of raw materials as such. That fact was pointed out as clearly as possible by me to those who wanted me to undertake the job. I resisted taking the job for a long time, and only finally took it when it became almost embarrassing for anybody after the outbreak of the Korean war to refuse to do any job which was requested of one by his Government.

I was told that the reason I was selected was that what was required was a person with a high degree of objectivity, one who had had some administrative experience, and one who had no prejudices, one way or the other, about the issues that might be looked into by the study which we were asked to make.

In other words, somebody who could make a study with a completely open mind not having taken a position on anything as a member of an industry which dealt in raw materials or which depended upon raw materials.

Senator MALONE. Then did you select your own assistants? Was there any suggestion made to you or did you have any hand in picking the other Commissioners?

Mr. PALEY. I was asked to make suggestions, names of people who I thought might serve well as fellow Commissioners with me. I submitted names of certain people after a thorough investigation on the backgrounds of the long list of names I had in front of me and based very largely on my recommendations, I think, the other Commissioners were invited to serve.

Senator MALONE. Would you mind giving us the names of some of them that you recommended?

MEMBERS OF THE PALEY COMMISSION

Mr. PALEY. The Commissioners who finally were selected to serve were George Rufus Brown, of Houston, Tex; Arthur H. Bunker, of New York; Eric Hodgins, of Florida and New York; and Edward S. Mason, of Cambridge, Mass. I have a little background on each here.

Mr. Brown is a mining engineer and is president of the Brown Engineering Corp. and chairman of the board of the Texas Eastern Transmission Corp., as well as executive vice president of Brown & Root, an engineering construction firm. He began his working life as a mucker and sampler for the Anaconda Copper Co.

Mr. Bunker's training was in electrical engineering. He has a long and distinguished career in metals and minerals, as president of the Radium Co. of Colorado, founder and first president of the United States Vanadium Co., and now president and director of the Climax Molybdenum Co., director of the American Metal Co., Ltd., Firth Sterling Steel & Carbide Co., and the Lehman Corp., of which he was executive vice president before the war. During the war, he served in the Metals and Minerals Office of the War Production Board.

Mr. Hodgins is a chemical engineering graduate of the Massachusetts Institute of Technology. Most of his working years have been spent with the Luce publications. He was managing editor and publisher of Fortune magazine, later a vice president of Time, Inc.

Dr. Mason is a notable economist and dean of the graduate school of public administration at Harvard University. He is particularly eminent in the field of foreign economics and has served on many Government assignments, particularly with the Department of Defense and the Department of State.

Senator MALONE. That is a very impressive background.

At this time we will make a part of the record of this committee the staff study of what is generally known as the Paley report entitled "Resources for Freedom." It includes a list of the members and staff together with their background.

(The document referred to was marked "staff study," and appears in the Appendix.)

Senator MALONE. Let the record show Senator Barrett, a member of the committee, is present.

We are glad to have you here this morning. Senator Dworshak is a member of the Interior and Insular Affairs Committee of which this is a subcommittee and we are mighty glad to have him here this morning.

Mr. Paley, would you give us some idea of the cost of the report, that is the money expended in the making of this report.

COST OF PALEY COMMISSION REPORT

Mr. PALEY. I cannot give you the exact figure. I can get it for you but to the best of my recollection the report cost around $900,000.

Senator MALONE. Now were the Commissioners, members of your Commission, paid for their work?

Mr. PALEY. I think some were paid on a per diem basis.

Senator MALONE. Per diem and expenses?

Mr. PALEY. And expenses.

I took no pay for the work I did on the Commission by way of services. I think some of my expenses were paid for but I think a very small part.

Senator MALONE. Do you know what was expended in the printing of the five volumes?

Mr. PALEY. To the best of my recollection, a budget of about $55,000 for that.

Senator MALONE. How many copies of the report were printed?

Mr. PAGE. I believe the print order was about 10,000.

Mr. PALEY. I think it varied between five and eight or nine thousand depending on which volume you are talking about. We knew there would be a greater demand for some volumes than others.

(The information is as follows:)

ATTACHMENT A

1. Number of copies of Resources for Freedom ordered by the Commission:

Vol. I	9,000	Vol. IV	4,000
Vol. II	4,000	Vol. V	4,000
Vol. III	4,000		

2. Cost to Commission of plates, printing, production, etc.:

Vol. I	$15,794.80	Vol. V	$7,986.59
Vol. II	14,372.04		
Vol. III	2,949.82	Total	55,788.55
Vol. IV	14,685.30		

Additional printing runs have been made by GPO as follows (for sale by Superintendent of Documents):

Vol. I	7,500 and 4,000	Vol. IV	7,500 and 4,000
Vol. II	7,500 and 4,000	Vol. V	7,500 and 4,000
Vol. III	7,500 and 6,000		

For the use of Congress (House print):

Vol. I	1,260	Vol. IV	1,260
Vol. II	1,260	Vol. V	1,260
Vol. III	1,260		

Number of sale copies on hand at GPO March 19, 1954:

Vol. I	595	Vol. IV	1,825
Vol. II	1,196	Vol. V	2,329
Vol. III	5,953		

Senator MALONE. Was the work done by the Government Printing Office?

Mr. PALEY. The work was done by the Government Printing Office. A charge was made for the copies that were sold.

Senator MALONE. What is the charge?

Mr. PALEY. $6.50 for the five volumes. I might add I think the first edition was completely sold out and they ran some additional ones.

Senator MALONE. They just kept the printing setup for additional volumes?

Mr. PALEY. Yes.

Senator MALONE. The cost of printing the report was not included in the $55,000.

Mr. PALEY. Yes, it was. That was the budget we had set aside. We did not take credit for any income gained by the Government Printing Office.

Senator MALONE. Was there any expenditure in the setting up of the report or the matter of planning the report other than that taken care of by the Printing Office?

Mr. PALEY. We had to pay for the making of charts and for some of the art work that was used in connection with the report.

Senator MALONE. What did that amount to? Do you have any idea?

Mr. PAGE. I am Norvell Page, editor of the report. We had a staff man who did that work. He was on a per diem basis. I could not tell you the total.

Senator MALONE. That came out of the $55,000.

Mr. PALEY. Yes.

Senator MALONE. It was held within that budget?

Mr. PALEY. Yes.

Senator MALONE. How much of a paid staff did you have?

Mr. PALEY. It varied. I think at its maximum the staff consisted of about 130 people.

In addition, of course, we had a lot of help from Government agencies in Washington and I would like, at this point, to tell you how valuable this cooperation was, particularly from the Department of the Interior, and in the Department of the Interior especially from the Bureau of Mines and the Geological Survey. They gave us much valuable information on which we were able to base our views and later some of our recommendations.

DEGREE OF SELF-SUFFICIENCY WITHIN THE UNITED STATES OF STRATEGIC AND CRITICAL MATERIALS

Senator MALONE. Did they make any recommendations as to the self-sufficiency of these materials in the United States or in other nations along with their factual material?

Mr. PALEY. I do not believe they made any recommendations, sir, but they certainly gave us a lot of information about our known reserves and about reserves in other parts of the world.

Senator MALONE. Were they asked to make such recommendations?

Mr. PALEY. We did, of course, at many times have people confer with us for the purpose of getting their views on some of the questions we were discussing and studying and people from the Department of Interior participated in those discussions.

Senator MALONE. Were there any of the staff members—and I suppose their background is already entered into the record—who were engineers in addition to Brown and Bunker and Hodgins?

Mr. PALEY. You mean on our staff?

Senator MALONE. Not on the staff but on the Commission.

Mr. PALEY. No. As I say, I gave you the full background on the men who served on the Commission. I have no background in the field and Dr. Mason has none.

Senator MALONE. Dr. Mason is an economist?

Mr. PALEY. Yes, and I think has had an opportunity to study the field of materials over the years but not as a member of the materials industry as such.

Mr. MASON. As you probably know, the report was distributed to various Government agencies for their comments after the report appeared, including of course, the Department of the Interior, the Bu-

reau of Mines, and the Geological Survey; and those comments by the various Government agencies on the recommendations of the report were assembled by the National Security Resources Board and presented to the President.

Senator MALONE. The National Security Resources Board——

Mr. MASON. I have here a copy of the evaluation of various Government agencies of this report.

Senator MALONE. Was that after the report was printed?

Mr. MASON. Yes, sir.

Senator MALONE. We will make this evaluation labeled "Objectives of the United States Materials Resources Policy and Suggested Initial Steps in Their Accomplishment" by the National Security Resources Board, Executive Office of the President, exhibit No. 1 for the use of the committee.

(The report was marked "Exhibit No. 1" for identification.)

Senator MALONE. This letter to the President submitting this report was signed by Mr. Jack Gorie, Chairman of the National Security Resources Board. I am sorry we do not have a list of the members of the old NSRB.

Mr. PALEY. I have been told but I am not sure of this fact, that a similar evaluation is now going on by the new administration.

Senator MALONE. I hope so. Is the Office of Defense Mobilization making that study?

Mr. PALEY. That is the agency headed by Mr. Flemming.

Senator MALONE. Yes.

Mr. PALEY. I was told they are doing it.

Senator MALONE. Dr. Flemming is an important man in this. He is head of the Office of Defense Mobilization and as such can nullify any order for materials coming down even from Mr. Wilson, the head of the Department of Defense and a Cabinet officer, so we are informed. That is our best information at this time.

In the titanium field when the National Defense Administration recommended 35,000 tons annually of titanium it was cut by Dr. Flemming's organization to 22,000 tons, later raised to 25,000 and now I understand raised to 35,000. We just summed up the titanium picture on Wednesday, the day before yesterday. We had Dr. Flemming and General Metzger and the head of GSA and other organizations. I think the titanium expansion business is underway now. The road block is torn open.

You have already said that you have had no experience in the field of minerals but you have had the necessary administrative experience and that we think is adeqautely demonstrated by the position you now have.

You said that you had access to the Bureau of Mines engineers and you did ask them for a report on all of these minerals and materials that you covered in their field.

Mr. PALEY. Yes; much of the information in our report was supplied to us by the Bureau of Mines.

Senator MALONE. Do you remember or is it a matter of record, how many engineers you had on your staff out of this 130? Was that it?

Mr. PALEY. 130 maximum.

Senator MALONE. 130 assistants?

Mr. PALEY. Staff members.

Senator MALONE. Do you know how many of them were engineers or ever had experience in the field?

Mr. PALEY. I think at the beginning of volume I of our report there is a complete list of the people on the staff. They are not identified as to their background and expertness.

Senator MALONE. Is this a complete list?

Mr. PALEY. This is not a complete list in that it does not include everybody who helped us in our work. It includes those who worked during the major portion of the studies and who made the more important contributions.

Mr. PAGE. It is all-inclusive of principal staff. Secretarial staff are listed also and those who acted as advisers are listed in chapter 31, the final chapter of the book.

Senator MALONE. Under the staff members for domestic resources, we have a group headed by Wilbur C. Fritz and Allen F. Mathews and 18 staff members. How many of these people had experience in the field of natural resources?

Mr. PALEY. I think all of them had some experience, sir. I am not sure.

Senator MALONE. How many were engineers or had any practical background?

Mr. PALEY. I cannot give you that.

Senator MALONE. Would you furnish it to the committee?

Mr. PALEY. I will.

Senator MALONE. I am principally interested in their training in the engineering or production field.

In foreign resources there is Raymond F. Mikesell and Isaiah Frank and nine other members.

Will you do the same for those members?

Mr. PALEY. Yes.

Senator MALONE. Will you please furnish it to the committee at your earliest convenience.

(The information requested is as follows:)

ATTACHMENT B

EXPERTISE OF DOMESTIC AND FOREIGN STAFF

In addition to consultants, advisers, and research organizations listed elsewhere, persons with practical business or engineering experience who contributed to the Domestic and Foreign Resources Section of the report included:

Dr. Alan M. Bateman, consulting geologist, Kennecott Copper Co. since 1916. Professor of geology, Yale University since 1916; Director, Metals and Minerals, Foreign Economic Administration, 1942–46.

Dr. Frances H. Clark, graduate Massachusetts Institute of Technology; consultant in metallurgy.

John Croston, graduate Colorado School of Mines and Leland Stanford, Jr., University; with various mining companies in United States; minerals and metals analyst with Government agencies since 1941.

Nathaniel M. Elias, graduate in chemical engineering, Columbia University; consulting chemical engineer.

Samuel G. Lasky, graduate Colorado School of Mines; United States Geological Survey.

Dr. Thomas S. Lovering, graduate Minnesota School of Mines; United States Geological Survey.

Mary McDermott, research economist, Atlantic Refining Co., on leave for work with Commission staff.

Chaplin Tyler, development department, E. I. du Pont de Nemours & Co.

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Senator MALONE. Now, Mr. Brown, Mr. Bunker, and Mr. Hodgins, were they in the production field or what particular field did their experience relate to?

Mr. PALEY. Well, as I stated before, Mr. Brown is a mining engineer and president of Brown Engineering Corp. He has been in many fields particularly in the southwestern part of the country.

He is head of what is, I think, the largest construction company in the world at this time. He has had a lot of experience in mining and seemed very familiar with the entire field and also with its problems.

Senator MALONE. I have been in the engineering field for 30 years and an engineer is not a producer, generally speaking, unless he gets into that field and therefore that was the reason for the question.

How about Mr. Bunker?

Mr. PALEY. Mr. Bunker is now president of the Climax Molybdenum Co., which is the largest producer of molybdenum in the world.

Senator MALONE. Mr. Brown is in the petroleum field?

Mr. MASON. Also in the mining field.

Senator MALONE. Is he in the production field or is he an engineer in the engineering field?

Mr. PALEY. He has been in the mining field and in the oil field.

Senator MALONE. A producer?

Mr. PALEY. Producer. He has had a lot to do with transmission systems, particularly with oil and gas.

RECOMMENDATIONS OF THE PALEY COMMISSION

Senator MALONE. Now, Mr. Paley, will you give us some idea for the record as to how the recommendations were reached by the Commissioners on this report? Were they unanimous recommendations or how were the minority recommendations handled? Could you give us an idea of how you separated the wheat from the chaff in making recommendations?

Mr. PALEY. In every case the recommendation was unanimous. There is no minority comment about any of the recommendations which we made and we made 78 recommendations.

Senator MALONE. Mr. Paley, out at the American Mining Congress in Denver in 1952, two of your commissioners, Mr. Brown and Mr. Bunker, felt called upon to explain the difference in the meaning of the words "belief," "conclusion," and "recommendation," as used in the report.

We believe men like Brown and Bunker do have good backgrounds, we have to find out more about their statements. You say that they were unanimous in their approval of all the recommendations?

Mr. PALEY. Yes, sir.

Senator MALONE. Here is what Mr. Brown and Mr. Bunker said. They explained the difference between beliefs, conclusions, and recommendations as used in the report in a debate with Mr. Fletcher, president of the St. Joseph Lead Co.—do you know him?

Mr. PALEY. Yes.

Senator MALONE. Mr. Fletcher is quite a large producer of lead and zinc. No question about his background. Now this is a quotation:

> Mr. Brown, I would like to say a word. I think every person who read this report will find "believe" and "recommend" but you can readily see where you have

five on a commission that you have a lot of differences of opinion and we wrote a lot of pages you are reading and where we could not come to complete agreement, we failed to recommend. We simply said "We believe," and if you will read the report with that in mind I think you will see that this controversial thing we have been talking about most today is not a recommendation by this Commission and we did not in any way intend for it to be a recommendation.

Are you familiar with their statements in that regard?

Mr. PALEY. I am, sir. That had to do with that portion of the report that discussed the possibility of using buffer-stock arrangements for the purpose of stabilizing or attempting to stabilize the price of raw materials.

Senator MALONE. What do you call buffer-stock arrangements?

Mr. PALEY. Before I answer that question, Senator, may I just give you a paragraph or two out of a short prepared statement I have which I think might clear this point up you have just raised?

Senator MALONE. I might say, if you have a prepared statement you would like to read, you are perfectly welcome to read it.

Mr. PALEY. I have a prepared statement which I thought was pertinent to your inquiry. It is a short number of words, as compared to the report itself. I have attempted to give you some background on the Commission and some of its findings.

Senator MALONE. Go right ahead and go through your statement.

Mr. PALEY. I am extremely pleased that the Senate of the United States, through this committee, has undertaken to assess the availability of critical raw materials in time of war, and to study and recommend methods of encouraging developments to assure materials for an expanding economy and for security. I and my colleagues on the President's Materials Policy Commission spent 17 months studying these problems. We hope that you will feel free to call upon any and all of us. We will be glad to do whatever we can to aid your important studies.

The focus of our study was upon the long-range materials needs of the United States and of other nations of the free world. We tried to look a considerable time ahead—to a period 20 or 25 years from now—instead of dealing with immediate problems.

Before going on to give you our concept of the materials problem and what might be done about it, I would like to tell you something about the members of the Commission and the background of our study.

MEMBERS OF PALEY COMMISSION AND BACKGROUND

The members of the Commission, besides myself, were George Rufus Brown, of Houston, Tex., Arthur H. Bunker of New York, Eric Hodgins, of Florida and New York, and Edward S. Mason, of Cambridge, Mass.

Mr. Brown is a mining engineer and is president of the Brown Engineering Corp. and chairman of the board of the Texas Eastern Transmission Corp., as well as executive vice president of the Brown & Root engineering construction firm. He began his working life as a mucker and sampler for the Anaconda Copper Co.

Mr. Bunkers' training was in engineering, electrical engineering. He has a long and distinguished career in metals and minerals, as president of the Radium Co. of Colorado, founder and first president of the United States Vanadium Co., director of the American Metal

Co., Ltd., Firth Sterling Steel & Carbide Co., and the Lehman Corp., of which he was executive vice president before the war. During the war, he served in the Metals and Minerals Office of the War Production Board.

Mr. Hodgins is a chemical engineer of the Massachusetts Institute of Technology. Most of his working years have been spent with the Luce publications. He was managing editor and publisher of Fortune magazine, later a vice president of Time, Inc.

Dr. Mason is a notable economist and dean of the Graduate School of Public Administration at Harvard University. He is particularly eminent in the field of foreign economics and has served on many Government assignments, particularly with the Department of Defense and the Department of State.

I have been associated with the Columbia Broadcasting System since 1928, first as president and now as chairman of the board.

Our field of study was outlined in the broadest terms; departments and agencies were instructed to assist us; and we were assured—as indeed I would have insisted had it been necessary—that we could make whatever recommendations seemed to us useful and wise without regard for whether they conformed with established policy. I am glad to say that at no time was there any hint of interference or control. The results we produced, and the recommendations we made, were our own.

I would be the last to say that we found the ultimate answers to any of the problems we considered. I do want to emphasize that the problems are grave and will increase as our economy grows.

ORE RESERVES AND RATE OF CONSUMPTION WITHIN THE UNITED STATES

There is, as the Commission saw it, no chance of the United States actually running out of materials. We are not and will not be in the foreseeable future a have-not nation. But we are drawing down our bank balance of materials day by day. There is serious danger that, as we are forced to use poorer and poorer grades of materials, it will cost us too much to win them.

The volume of our demand is huge and increasing. In 1950, for example, we consumed 2,700 million tons of materials, an average of about 18 tons for every citizen. By 1950, in comparison with 1900, we were taking from the earth 2½ times more bituminous, 3 times more copper, 3½ times more iron ore, 26 times more natural gas, 30 times more crude oil.

And, quoting from the report:

> There is scarcely a metal or a mineral fuel of which the quantity used in the United States since the outbreak of the First World War did not exceed the total used throughout the world in all the centuries preceding.

In fact, the United States, with less than 10 percent of the population of the free world and only 8 percent of the land area, is using more than 50 percent of all the materials turned out by the entire free world. Of that total, we produce from our own land about nine-tenths of what we consume.

It is a tremendous drain.

We must expect that drain to increase in the years ahead.

I would like to emphasize that we made no prophecies about the amount of materials that the United States might be consuming by

1975. Nobody can prophesy a thing like that. We did try to make some informed estimates about possible demand.

The basis of our calculation of demand was a population of 193 million—by the way, the Bureau of the Census since our report was issued stated they believe the range now will be between 199 million to 221 million.

Senator MALONE. At what date?

Mr. PALEY. By 1975. Of course, a large increase in population over our 193 million estimate would mean an even larger demand for materials.

Senator BARRETT. Might I ask a question there?

Senator MALONE. Yes, at any time.

PROJECTION OF REQUIREMENTS OF MATERIALS—1975

Senator BARRETT. I am curious as to how the Bureau of the Census arrived at any such figure in light of the fact that the population is increasing at the present time at nearly 2½ million a year. I have heard some estimates made that there may be a decline in the very near future because of the fact that the children born during the early days of the depression will be coming into maturity and there would be less of them than in the period immediately prior to the depression and after the depression.

It seems to me on the whole that those figures are not too realistic if we are going to have the population increasing at a higher rate as time goes on which would seem only natural and in view of the fact that there are 2½ million more people a year at the present time and it would seem to me 10 or 15 years from now it would be probably at a rate between 3 and 4 million a year.

I have not made any study of this matter but it occurred to me that they have been pretty much off base on anticipating the population of this country 10 years from now or 15 years from now in the past and it would seem to me they are doing the same thing now as far as the future is concerned.

Senator MALONE. Senator, it could be that upon further study of the Government figures that Mr. Paley and his associates had overestimated Mrs. Sanger's influence.

Mr. MASON. Could I make a comment on this? A projection of population growth depends on three elements: what the birthrate is likely to be, what the death rate is likely to be and what net immigration into the United States is likely to be. I would agree that the Census Bureau at least until recently has been consistently low on estimates of population.

Recently they have increased their projection for 1975. The figure we used was the census median estimate of population for 1975. Now their minimum estimate is 199 million. I think that the difficult problem in these population projections is the question of whether the birthrate which has been extraordinarily high in the United States for the last 8 or 10 years is likely to continue high. There are some reasons for believing that the extraordinarily high birthrate has been due to the mobilization situation. Young men going into the Army at an early age which has brought about a lower age in marriage than might be expected to continue.

I think I would agree with you that this is a highly debatable area.

Let me make one final statement. The present maximum estimate of

population in 1975 supplied by the census is 221 million and that involves a rate of increase in the United States population of 1.51 percent per year. The figure we used involves a percentage rate of increase of only slightly over 1 percent a year. They have in their recent estimates increased very sharply their projection of population growth.

Senator MALONE. I am interested in what Dr. Mason says about earlier marriage on account of war. It is impossible to predict what Congress may do. You will recall in the last war there was a provision for educating the GI's and for a greater allocation. In the First World War I do not believe you will find the increase was so great because Congress was not supporting the families. We waited until after we came back to get married but in World War II and then in Korea they could get married any time and get paid for going to school and support families. Maybe Congress had something to do with that.

Mr. MASON. That is a very pertinent remark.

Senator BARRETT. Everybody has answered my question except the gentleman to whom I directed it, Mr. Paley. Let us give him a word edgewise.

Mr. PALEY. I defer to Dr. Mason's superior knowledge in this field.

Mr. MASON. There is one implication of these remarks that the committee ought to be aware of. If, indeed population in 1975 is 215 million instead of 193 that, of course, would tremendously increase the materials requirements which this country has to face in 1975.

Senator MALONE. Do you have any questions, Senator Dworshak?

Senator DWORSHAK. No.

Senator BARRETT. That is a very important contribution Dr. Mason made there. I think that in all of these problems that we ought to prepare for the worst and hope for the best, as they say lots of time.

I am inclined to think that that maximum figure is more likely to be correct than the minimum figure of 193. So it would seem to me that when we are trying to provide here for the best interests of our country in the next 20 years that we ought not to take too many chances and we ought to be in a position where we can protect the country in peacetime and in wartime also. I think that is an important item to take into consideration.

Senator MALONE. It is beyond any doubt, Senator Barrett. I would like to point out, Mr. Paley, at this point that all prior estimates that received any recognition and that at least stuck in our minds have proved to be low.

Mr. PALEY. You are talking about estimates of demand now.

Senator MALONE. Estimates of population which have something to do with demand. It is a good deal like all weather forecasts failing in dry weather.

In 1951 you made this forecast for 1975. I am asking you if you have any apprehension about it, because we have traced the history of other forecasts made in the recent past. For example, in 1932 President Hoover appointed an eminent committee of social scientists, headed by Dr. Wesley C. Mitchell. Its report, entitled "Recent Social Trends in the United States," forecast a population of 145 million for 1950. The actual population in 1950 was 150.2 million. It is now 160 million.

In May of 1938 the National Resources Committee, appointed by President Roosevelt, released a population study entitled "The Prob-

lems of a Changing Population." This study predicted that by 1955 the population of the United States would be 138 million, and that it would reach a maximum of 153 million in the year 1980. Needless to say, this forecast now looks ridiculous.

In December of 1938 Dr. Isidore Lubin, then the Commissioner of Labor Statistics, forecast a 1960 population of 145 million. This goal was actually attained in 1947.

Another classic forecast was made by Floyd W. Parsons, editor of the Gas Age Record in 1921, which predicted that by 1941 we should have completely exhausted our petroleum reserves and, of course, it is well known we now have more petroleum than we ever had in the history of the world and, of course, more than we had in 1921.

Now it seems to me and I do not want to interrupt the remainder of your statement, that these forecasts simply emphasize the necessity, Senator Barrett, of the Congress establishing principles that will be an incentive to the investment of private capital and the production of these resources when we need them. In other words, the opportunity should match the need. The more the need, the more the opportunity. We had a case here where Harry Dexter White in a very learned memorandum to Secretary Morgenthau during World War II made a prediction that we would be out of petroleum in 16 years. We supposedly had a 16-years' supply, on the basis of our 1938 domestic consumption, on the basis of consumption in 1943, we would be out of it in 13 years, manganese in 9 years on the basis of 1943 usage; 23 years for tungsten, based on 1939 usage, and 3 years on the basis of 1943 usage. This was dated January 10, 1945.

HARRY DEXTER WHITE'S ESTIMATE ON AVAILABILITY OF STRATEGIC AND CRITICAL MATERIALS

Senator BARRETT. I would like to make one observation with reference to petroleum before you get too far off that. Mr. Harry Dexter White said in 1944 that at the rate of consumption in 1943 we would be out of oil in 13 years.

Senator MALONE. 13 years on the basis of 1943 usage. He said it in 1944.

Senator BARRETT. He said it in 1944.

Senator MALONE. Yes; that time is almost past.

Senator BARRETT. I want to make this point, however, that during the year he was referring to our consumption was at the rate of 5 million barrels a day, this was in wartime; and everybody anticipated and no doubt he did too, that when the war was over the demand would decrease and that we would not be consuming as much oil in peacetime as we were in wartime.

But the exact reverse was the fact. The minute the fighting ended the consumption of oil in this country went up and at one time it was considerably over 6 million barrels. I do not know the top that it hit but it was over 6 million I am sure. So that all these facts prove just one thing. That these people that make these predictions about 99 times out of 100 do not know what they are talking about and quite certainly White's belong in that class.

Senator MALONE. I think with this kind of estimate you can say just about 100 times out of 100 but it is interesting to review the history because there are honest men who make predictions and there are men

with ulterior motives who make predictions. I want to say this committee has been holding these hearings since Congress adjourned last August. The committee was created at that time for this purpose. We have heard perhaps 20 or 30 alphabetical agencies all working in separate fields with little or no connection with each other and most of them doing an honest job according to the orders they have and the lights of their judgment and most of them staffed by good men. But they do not know what the other department is doing and they are doing the best they can.

POLICY OF DEPENDING ON FOREIGN SOURCES OF STRATEGIC AND CRITICAL MATERIALS

But as we got along after 15 or 20 of them we could begin to see a pattern. What was that pattern? The pattern was woven very clear in my judgment, but I cannot say that definitely because the committee has not yet studied all the evidence, the pattern included two policies making us dependent on foreign nations across major oceans for things we could not fight without, and moving us from a civilian economy to a war economy in our use of materials here.

In other words, using imports, we find at the moment that we are getting 900,000 tons of manganese from India.

I just mention one material. We have perhaps 15 or 20 similar examples. That is about half of our annual consumption. The consensus of opinion of military strategists is, you cannot get a ton of manganese out of India when war starts so you are whipped when you run out of your stockpile.

Mr. PALEY. We have discovered rich deposits in South America.

Senator MALONE. We have a lot of deposits in America that can be utilized if the producers get an additional price per unit that would make up the difference in labor cost and taxes in this country with those in the chief competing nations. The western hemisphere can be made self-sufficient and we will show that in our report.

Mr. MASON. Could I make a comment?

Senator MALONE. I would like you to.

OIL AND GAS RESERVES PROJECTED

Mr. MASON. I would like to address my remarks to this question of prediction and projecting requirements with special reference to oil. It was precisely because of the facts you have brought out so well that the Commission did not make any prediction as to how much oil the United States would produce 10 years from now. What they did say is that as far as they could see the requirements for oil, the consumption of oil, was approximately going to double over the next 25 years. They went on to say that these requirements might be met in any 1 of 3 possible ways. If it turns out that we discover plenty of oil, then we can probably meet those requirements very largely from domestic production of natural oil. If it turns out, on the other hand, that we do not discover as much oil, then those requirements might be met in 1 or 2 ways.

They might be met by importing more oil or they might be met by developing shale oil or other types of synthetic-oil production. As far as the Commission's report goes, it makes no forecast at all as to what the production of natural oil is likely to be in the United States.

There is one more statement I would like to make, and that is, I would like to call your attention to the difference between a projection and a prediction here. I think you will find if you look at this report that the Commission nowhere predicts. What it does do is to project requirements on the basis of certain assumptions. If those assumptions are correct, then the projection might turn out to be a good prediction but the projection is only as good as the assumption on which it is based, and nowhere does the Commission so far as I remember make any predictions as to what our requirements are going to be. It says only that if these assumptions are reasonable assumptions, then it is probable that our requirements will be such and such 25 years from now.

Senator MALONE. We are coming to that very recommendation that you made in due time. We will get around to you.

Senator BARRETT. There is one very important element Dr. Mason left out of his calculations perhaps inadvertently, but that is the one thing that changed this whole picture.

That is the recovery of oil. I know a little bit about this oil business, because I have lived around the edges of it.

Senator MALONE. Your State produces an enormous amount of oil and could produce more.

Senator BARRETT. I can say to you 25 years ago the recovery was less than 20 percent.

Ten years ago it got up to about 35 percent. Take it around 60 percent now. Who knows in the next 25 years whether or not that might not be 80 percent?

Now, the effect of all that is this: That the secondary recovery from these oilfields throughout the country has equaled the original discoveries. So in fact what you are doing, as I see it, science is going in here and rediscovering new fields by recovery methods. That is something that I think these people, like Harry Dexter White and a few others who got into a field they knew absolutely nothing about, ignored, and their predictions are 100-percent wrong.

Senator MALONE. I want to show and will show by the table I am about to complete reading from Harry Dexter White's letter of transmission to Secretary of the Treasury Morgenthau that his views had a profound effect on the national policy of the United States and that probably Harry Dexter White knew better but he used these various reports, however innocent they may be, in a prediction that caused us to become reliant upon foreign nations across one or both major oceans for the things we could not do without in a war.

I may say this concerning all these predictions over the years, that engineers are generally very careful about making predictions. I think that was the reason Mr. Brown and Mr. Bunker were explaining in Denver where they were surrounded by very good engineers and being interrogated by them that they wanted to clarify the record as far as they were concerned.

These elaborate reports over the last two decades to the Presidents of the United States have overlooked entirely the laboratory work and the effect of inventions.

Mr. PALEY. We put very heavy emphasis on that, Senator, as you will see in our report.

HARRY DEXTER WHITE'S ESTIMATE OF MINERAL RESERVES

Senator MALONE. Now let me complete reading this table and I will have a few comments on it. Mr. White said tungsten would be out in 23 years on the 1938 usage. Based on 1943 usage we would be out of it in 8 years. Lead would last 7 years on the basis of 1938 consumption and based on 1943 consumption 6 years.

Mr. White said of chrome, no record, less than 1 year's supply. Let me say there is more chrome in Montana than you can use in any reasonable war. But the Secretary of State informed a large number of women that were here yesterday for a special purpose that we had no chrome, we had to get it from Russia.

Of course, it shows an utter ignorance or disregard of facts. Chromite sources are not confined to the United States. There are other deposits in the Western Hemisphere.

Now with mercury, Mr. White said a 3 years' supply. This was on 1938 usage and a 2 years' supply based on 1943 usage. As a matter of fact, you could again become practically self-sufficient in the production of mercury in this Nation as we did in World War II. I was special consultant to the Senate Military Affairs Committee at that time and I made a report on it.

In other words, I am reminded of the remark someone made one time that there is no one who can talk quite so convincingly on a subject as one entirely unhampered by the facts. That does not at all refer to you, because there are certain things in your report that are very valuable but I am coming to the recommendations very soon. Now White's report went to Morganthau. He recommended that we save our raw materials in this Nation and import them from foreign nations and went on to build up Russia as a potential producer. He wanted the United States to just loan them the money to get started. This letter has already been made a part of the record. The important thing is that Morgenthau, whether he knew what he was talking about or not, whether he understood the situation or not is immaterial, made the same recommendations to the President and his letter has been made a part of our record. Then Mr. Truman in announcing the signing of the stockpile bill in 1946 said, "I am signing this bill very reluctantly because this administration does not agree with the Buy-American clause."

FALSE THEORY OF HOARDING MINERAL AND METAL FOR FUTURE USE

He believed that we should save our materials and import them from foreign countries and stockpile them. That was the policy we followed. Mr. Ickes, the great Secretary of the Interior, who was never west of Chicago until he was appointed Secretary, did not know a pound of ore from a bale of hay. He preached for almost the entire time he was in office, that we save our materials and import them for our use. So as a result we are now dependent upon these foreign nations across major oceans for many of these materials. We have also been moved from a civilian economy to a war economy in a great many industries.

Therefore, your unemployment is piling up and you are still buying materials under contracts abroad where you are paying more in certain instances under GSA contracts, that is on stockpile contracts, than you

paid your domestic producers. All that was part of a policy. Many of these predictions were made by honest men. They were used to advantage by some who wanted to make us dependent upon certain areas where those things that you could not fight without would be unavailable to us in war. That is the problem. This resolution simply told this committee to determine how to make them available in time of war.

Mr. PALEY. We have come out very clearly against the theory of hoarding for future use. We do think that we ought to use what we have as economically as possible. We pointed out I think that if hoarding for future use had been the prevailing theory during the days of our Founding Fathers we would probably still have a large supply of whale oil which we would have no use for today.

Senator MALONE. You could go further than that and say that if Mr. Ickes had been Secretary of the Interior in 1925 when the USGS said that 5 billion barrels of oil was all our reserves and if we had followed his policy we would still have no oil.

NEED INCENTIVES FOR PRIVATE CAPITAL INVESTMENT

I want to point out here, and I do not want to delay the completion of your statement, but it is pertinent, that many of us have believed for many years that what you need is an incentive for the investment of private capital in the search for these materials. A government is helpless in finding these reserves. The government develops what is already found sometimes for a stockpile but even that is unnecessary if the incentive is there, the profit incentive.

When you have a 20-year policy that takes the profit out of finding new reserves then you find yourself with slowly dwindling reserves.

Mr. PALEY. We agreed that thoroughly effective incentives should prevail because of the importance of developing and maintaining a strong minerals industry in this country.

I think where we part company to a certain extent is that when we think in terms of trying to make this country as self-sufficient as possible, we stop short of wanting this country to become self-sufficient if the cost of that self-sufficiency is too high. I will come to that point a little later in my statement.

COST OF SELF-SUFFICIENCY

Senator MALONE. I would like at the moment, as long as you have mentioned it to briefly discuss it with you. Some of us believe that the economic cost of production in this country should include that added increment of cost per unit whether pound or ton or however you are considering it, that comes about due to the added standards of living, including our wages and taxes. When you compensate for our wages and taxes and that does not cover it, we are in agreement. You make your determination of cost without consideration of our wages and the other factors that create our standard of living. The living standard in this Nation is 10 times as high as in most of the places where we are dependent now for materials and at least twice as high, as in any other nation except Canada and of course Canada is a part of the Western hemisphere.

Mr. PALEY. Standards of living comparisons explain the differences at times but I think you must also remember that in many cases the differences in costs, real costs between certain materials found outside of this country and found inside this country, are caused by the richness of the ore in foreign countries as compared to our country.

Senator MALONE. I would say to you you can consider the richness but if you will also consider the difference in the added unit cost of the wages and the taxes and the other pertinent factors that uphold our standards of living and which make this the greatest market in the world we can go with you, but you did not do that.

Mr. PALEY. In copper I think the highest grade mine we have in this country, owned by the Kennicott Copper Co., is about 1 percent copper and there is 5 percent copper being mined in Africa today.

Labor alone or the difference in standard of living are not enough to make up for those differences.

Senator MALONE. Would you go on record right now as being in favor of some arrangement so that the domestic producer would be protected to the extent of the difference in labor and the difference in taxes and other pertinent factors on anything entering this country?

Mr. PALEY. That would depend on what effect that would have on our total economy. It comes down to the question of the real cost equation which I will cover.

Senator MALONE. What do you mean, total economy? Let us go into it now.

THEORY OF REAL COST

Mr. PALEY. I would like to present the theory of real cost first.

Senator MALONE. Go ahead with your statement.

Mr. PALEY. I talked about a population of 193 million. Which emphasizes the fact that our estimates—and I want to call them estimates—as to future requirements—were very much on the conservative side if these assumptions are correct. Our calculations also were based on a work force of 82 million, a shorter workweek, about 15 percent shorter—and an average annual increase of productivity of 2.5 percent a year. On this basis, it seemed likely our total production of goods and services would double in the next 25 years.

Out of these calculations, we tried to work out a target estimate of the amounts of various materials which would be called for by our economy around 1975. This would not mean a demand for double the amount of materials. In 1900, a dollar spent for raw materials supported about $4.20 worth of finished goods and services; in 1950, the raw materials dollar supported $7.80 worth, even after adjusting for changes in the general price level.

We calculated that we would require some 50 to 60 percent more materials by 1975. Instead of 2,700 million tons of materials, we would be using around 4 billion tons.

Senator MALONE. Is this proving we will not be able to produce enough here or in the Western Hemisphere or is it proving that we will be more reliant on foreign nations beyond the major oceans.

Mr. PALEY. It is showing the magnitude of the problem before we come to the ways through which we think we can meet the problem.

Senator MALONE. Go right ahead.

Mr. PALEY. It seems to us, judging from recent trends, that the load would fall with special weight upon the minerals section of our raw materials base. Whereas the demand for forest products might rise only 10 percent—I believe the industry thinks it would rise less than that—the demand for all minerals might well increase by 90 percent.

These were the facts on the demand side of the ledger.

On the supply side, we found that the United States could enormously increase its production of materials. Certainly, it would continue to supply the overwhelming bulk of its requirements. But it seemed unlikely that it could produce as large a percentage of our needs as we do now without incurring costs that would slow down our growth. The free market is the best arbiter of such trends.

Senator MALONE. Do you have a list of the materials somewhere in your statement with an estimate of the percentage we might——

Mr. PALEY. We have, yes. I do not have it in my statement but in the report. I will point it out later.

When we examined the production trends under the free market, this is what we found:

We found that in the 1900's we were producing more materials than we needed. In fact, leaving out food and gold, we were producing about 15 percent more than we consumed, and we were exporting the surplus. But by 1950, we were having to import about 9 percent of the dollar value of our materials consumption to make up the deficit in our production.

Senator MALONE. 1950?

Mr. PALEY. Yes; that is a shift from 15 percent on the export side in 1900 to 9 percent on the import side in 1950.

Senator MALONE. What date was it that there was a change of policy in the United States? When did we go into trade agreements where the State Department can lower tariffs so there would be no protection?

Mr. PALEY. 1934.

Senator MALONE. And this date is 1950. I am surprised it is not worse.

Mr. PALEY. Our calculations and studies convinced us this was a firm trend. It could be reversed by policy action, and at some considerable cost. But the market place under present conditions would not itself reverse the trend. In fact, as demand increases, imports by 1975 might well rise to 20 percent of our total consumption.

Senator MALONE. You assumed that our policy, a 20-year policy at this time, will continue; a policy where trade agreements are made on the basis of political deals with other countries and tariffs are lowered without regard to any differential in the cost of production.

Mr. PALEY. We were taking conditions as they are now or as they were then.

Senator MALONE. Assuming that it continued?

Mr. PALEY. That is right. As I say, it could be reversed by policy action.

TARIFF REGULATING RESPONSIBILITIES SHOULD BE RETURNED TO CONGRESS

Senator MALONE. In other words, if there were to be a policy adopted by Congress that there would be set a duty as the Constitution

of the United States calls it in article 1, section 8, where it fixes responsibility on Congress to do that job on an economic basis, if the Congress were to adopt the policy that trade would be on a basis of fair and reasonable competition with equal access to our markets but no advantage and add to the foreign cost the difference between the labor costs and the taxes and other pertinent factors which would automatically be added through a duty on the imports, then do you think your predictions would still prevail?

Mr. PALEY. No, sir. If high protective tariffs are imposed——

Senator MALONE. Not high.

Mr. PALEY. Higher——

Senator MALONE. Not higher. Equalize competition.

Mr. PALEY. As compared to what we have now.

Senator MALONE. You have none now, no protection? I am asking you if the Congress of the United States follows the Constitution and regains its constitutional responsibility of setting duties, imposts, and excises as was done for many years prior to this policy we now have of making trades on a poltical basis, give them equal access to our markets but no advantage, and there was a policy set down by Congress that the duty should be set on the basis of fair and reasonable competition, which would automatically equalize the difference between the labor cost and taxes and other pertinent factors, no high duty, no low duty, then what would you think about your present prediction?

Mr. PALEY. If the result of your conditions means higher tariffs than we have now the total result would be that we would import less.

Senator MALONE. In other words, you would have some incentive if it were done by law for a private investor to get money from his friends and go into the business on a long-range basis. If duties were set down by law as the Constitution provides rather than having them set by a Cabinet officer who can trade an industry down the river any day in the week. Do you think that would be better?

Mr. PALEY. I am not in a position to characterize the political——

Senator MALONE. I am not asking you to, but if you had a policy laid down by Congress by law and get away from the Executive orders that can be changed in the morning through another trade or Executive order, do you think that private money might go into the business a little more than it does now?

Mr. PALEY. Sir, I think that the——

Senator MALONE. Would be more incentive.

Mr. PALEY. I think the end result would not depend on who imposed these tariffs or duties but what the tariffs or duties would be irrespective of what——

Senator MALONE. I did not ask that question because I myself do not know what duties are required but you have a Tariff Commission in a position to find out. The tariff law at the present time stipulates that the determination of changes in tariffs automatically reverts to the tariff Commission if you do not renew the Reciprocal Trade Agreements Act. This act was passed in 1934 and was extended for 3 years repeatedly until 1951, when it was extended for 2 years. Last year the Congress extended it for 1 year. It will expire June 12, 1954, if it is not renewed.

All trade agreements will remain the same as they are unless the President of the United States serves notice on the country with which

a trade agreement has been made of 6 month's cancellation. That is true, is it not?

Mr. PALEY. Yes.

Senator MALONE. Now if it reverts to the Tariff Commission, then the law says that the Tariff Commission determines the cost, not the highest cost or the lowest cost but a reasonable cost of production in this country of each item, there are thousands of items, and then the cost not the highest, lowest, but a reasonable cost of this foreign article or a like article. They can take the customs declared cost or the offered-for-sale cost in this country as a base and recommended an equalizer to be the duty as the Constitution calls it. You would not know, I would not know how much it should be unless you become a member of the Tariff Commission or a staff member and devoted your entire time to it, but I am talking about a policy. I am not asking you what the tariffs should be, at the moment. I can say without any fear of contradiction that they do not amount to anything today.

BREAKS IN LEAD-ZINC MARKET IN FALL OF 1952 DUE TO DUMPING LOW COST IMPORTS

The zinc lead market was broken by a stockpile built up by England with our money and sent in here last year. The amount of your reserves in any metal or any production underground is dependent on price.

When zinc was 16 cents a pound you had a certain amount of reserves. At 10 cents a pound you have no reserves. Do you understand that reasoning?

Mr. PALEY. Certainly.

Senator MALONE. Go ahead.

Mr. PALEY. This gentleman, was the picture of our present and future materials position as we found it.

Our responsibility was to study the availability of materials for long-range economic growth and for national security in war, and to make recommendations for policy. We saw three paths to improving our position:

We can get more materials and more energy from our domestic resources by pushing back the technological, physical, and economic boundaries, that presently limit the supply. Find more; produce it more cheaply; find better ways of extraction and production.

We can alter our patterns of using materials by more efficient designs and processes—and by shifting the burden of use away from scarcer materials and toward more abundant ones. Titanium instead of stainless steel, for example, would require much less chrome to produce a stronger structural material.

We can get more materials from abroad, on terms beneficial to ourselves and other free nations. And in the process, we can strengthen both our economy and that of our allies.

No one of these by itself will be enough. We need to do all three.

I can touch only on some of our recommendations in each of these areas. We recommended incentives to stimulate domestic minerals production; continuation of depletion allowances; equalization of expensing provisions of the income tax laws as between oil, gas, and

other minerals exploration and development loans for small mining business.

Senator MALONE. Did you mean Government loans?

Mr. PALEY. Yes.

Senator MALONE. What makes it necessary for Government loans in any kind of business?

PROSPECTING ADVANCES FROM FEDERAL FUNDS

Mr. PALEY. In this particular case we think there are small people with the energy and enthusiasm to find new mineral deposits who just have not got adequate financing. It is a very risky business. As you know, we have a grubstake law now by which certain prospectors can get advances from the Government. We thought it was a good idea to continue that so that the pioneer spirit which still prevails among some people in the mining business could continue.

In detailing the recommendation we said, of course, that the prospector, this particular man we had in mind, had to be pretty good, that he had to put up at least 25 percent of his own money. If he found the mineral he was after, instead of paying back to the Government 100 percent, he would pay, say, 120 percent.

Senator MALONE. Would you recommend that the Government loan money to a zinc producer now at 10 cents or 11 cents when it costs him 15 cents to produce it?

Mr. PALEY. I am talking about the small person.

Senator MALONE. Small or large.

Mr. PALEY. I think if somebody had a prospect which he thought would lead to the discovery of a rich body of zinc or lead or copper he should be encouraged.

Senator MALONE. How rich do you think it would have to be to make a profit at $15 a day wages? The record shows, that with all payroll supplements, unemployment insurance and industrial insurance, and so forth, it costs about $20 per shift.

How rich do you think this zinc deposit would have to be to compete with 10-cent zinc coming in from abroad?

Mr. PALEY. I am not enough of an expert to answer that question.

Senator MALONE. I know that. We have testimony from the experts so it does not work out. If you recommended that they loan money to a zinc, lead, or even a copper producer now with free trade they would lose the money.

It would be as sure a way to lose money as could possibly be devised.

Mr. PALEY. These loans should not be made unless they looked to be advantageous from the standpoint of our demand requirements and from the standpoint of our total economy.

Senator MALONE. I am trying to say to you that no miner in his right mind would accept a loan if he had to put his own money in with it if he knew no matter what he found he would operate at a loss.

Mr. PALEY. People are not going to come for loans on the prospect of losing money on finding these particular materials which you have in mind.

Senator MALONE. They are not unless there is some protection of their standard of living. Covering the wages and taxes they pay by law and not subject to an executive agreement. Generally the qualifications for the executives who make these agreements are a complete

lack of knowledge of the business. I think that is pretty good history, too, and we have reviewed a lot of the reports.

Mr. PALEY. I think it should be applied mostly against those materials in short supply, particularly materials on which we could be hurt badly if we did not have enough of them during a war period.

Senator MALONE. We are talking about those materials. In the case of zinc and lead you could produce about 750,000 tons a year of each. You are producing now about 450,000 tons. You brought it about particularly by the competition of the low wage countries, sweat-shop labor countries with no equalizing of costs by law. Your Secretary of State has been very busy for 20 years making such agreements that just pulled the economic rug right out from under the domestic producer.

I will later ask you a few more questions in that regard. But go ahead. That is a very pertinent point in your statement.

Mr. PALEY. We recommended revising the mining laws to eliminate abuses and make validation of claims easier. Incidentally, at the recent Mid-Century Conference on Resources for the Future which the Ford Foundation financed, representatives of the mining industry undertook to study the laws with a view to recommending changes. We recommended extension of some aspects of the Minerals Leasing Act so that new methods of exploration—geophysical and geochemical methods—could be taken up over broad areas while giving protection to the explorer for his finds.

Senator MALONE. For 20 years there have been bills in Congress sponsored by the administration to do away with the Mining Location Act of 1872, which is right now practically the only law on the statute books that provides that a man without capital can go in if he is willing to work and has a sack of beans to eat and be in business if he finds something.

He cannot do that now with the free-trade ideas that we have. But he could do it and he can own it. Now the leasing setup always recommended leaving the prospector at the mercy of the Bureau official. If he does not do certain work in the way the administrative official that probably does not know anything about the business himself directs him he will cancel the lease. Therefore, you shut the last door in the face of prospectors.

Mr. PALEY. We recommended that the present system of claims and patents be continued with certain revisions to take care of abuses, but that the man be given the choice between whether he wanted to use——

NEW PROSPECTING TECHNIQUES ON MINERAL EXPLORATION

Senator MALONE. Why have the leasing and all if you can have a mining claim?

Mr. PALEY. The reason for the Leasing Act is that the provision dealing with claims is rather limited.

A claim consists of 20 acres.

Senator MALONE. There is no limit to the amount of claims that you can locate is there or is there if you do your assessment work?

Mr. PALEY. I am not sure but——

Senator MALONE. There is no limit.

Mr. PALEY. We were told by mining experts that when it came to the use of these new methods of exploration it was not economical to have to go out with a pick and shovel and try to prove there was something there. The most economic methods would be to take a broad area that could be analyzed, sometimes from the air. That was not an economic method for the person spending the money unless he knew ahead of time that if he found something he could get the benefits.

Senator MALONE. He could have it all located ahead of time.

Mr. PALEY. Location calls for some proof that there is reason to believe a mineral exists in that particular claim and the claim, of course——

Senator MALONE. I point out to you that engineers have been doing that for many years. Of course, the airplane has only been used in the last few years but he does not disclose the results he gets from the airplane if he finds it. But a Government official cannot take it away from him after he locates it.

Mr. PALEY. Some people in the mining industry thought the leasing method was good.

Senator MALONE. Who are these people?

Mr. PALEY. I do not have the names.

Senator MALONE. Can you produce them?

Mr. PALEY. Yes.

Senator MALONE. Did they work for the Government?

Mr. MASON. No, not in all cases.

Senator MALONE. Will you get me some cases where they did or did not work for the Government?

Mr. PALEY. I can get you three or four prominent mining men who thought there was real merit in having the choice.

ATTACHMENT C

INDUSTRY OPINION ON LEASING ACT

In a consultation with representatives and experts in the field of metals and mining industries, held in December 1951 the Commission reviewed a number of recommendations that were being considered, among them the suggestion, later made a recommendation, that leasing provisions of the Minerals Act be extended to the metals field to facilitate use of new methods of exploration, with the proviso that metals prospectors and mining companies would have the option of using either leasing or the claims-patent system, whichever offered individually the greatest opportunity. The transcript of this consultation is available in the executive files, in the possession of the Office of Defense Mobilization. Since the discussion was off the public record, permission of the individuals who attended should be sought before they are quoted. It is the distinct memory of Commissioners and staff, lacking current access to the records, that several of the industry people who attended the session, assented to the statement that the option of leasing might encourage exploration for hidden ore bodies, and would assist mining companies which wished to undertake large-area exploration, using new geophysical and geochemical methods.

We accordingly sent the following letter to a number of mining industry people who attended Commission discussions:

"DEAR ——— Following Mr. Paley's testimony before the Special Subcommittee on Minerals, Materials, and Fuel Economics of the Senate Committee on Interior and Insular Affairs in Washington on April 9, the Senate committee has asked for the support which the President's Materials Policy Commission received at a conference in December 1951 on the proposal of giving prospectors a choice between the claims-patent system and leasing. The proposal, later made a recommendation by the Commission, is that leasing provisions of the Minerals Act be extended to the metals field to facilitate use of new methods

of exploration, with the proviso that metals prospectors and mining companies would have the option of using either leasing or the claims-patent system, whichever offered individually the greatest opportunity. It is the distinct memory of Commissioners and staff, lacking current access to the records, that several of the industry people and other experts who attended the session, assented to the statement that the option of leasing might encourage exploration for hidden ore bodies, and would assist mining companies which wished to undertake large-area exploration, using new geophysical and geochemical methods.

"Because the conference with the Commission was off the public record and because it would be very difficult to go through files for your expression of views, it would be greatly appreciated if you would let me know by return mail whether your name can be used as having been in support of the proposal as outlined at that time and summarized above. The committee would like to have this information by next Monday, so your early reply to me is desired."

Herewith are excerpts from letters received in reply to Mr. Paley's inquiry:

Horace M. Albright, president of United States Potash Co.:

"Answering your letter of April 19, you can certainly put me down as a mining industry executive who saw only merit in the proposal that prospectors and others employed by mining companies should, by law, have the option of choosing either the leasing or the claims-patent system, whichever offered individually the greatest opportunity for finding and developing properties on the public domain for the production of metals."

Evan Just, vice president of Cypress Mines, Inc.:

"Referring to your letter of April 19, I cannot specifically recall whether or not I was present at the conference in December 1951 with the Paley Commission on any position taken at that time with reference to the optional substitution of leasing for the claim-patent system. If I was there, I may very well have acquiesced to the optional arrangement.

"I see no objection to the optional arrangement, but I would hold out for the optional concept as applied to minerals not already covered by the leasing system, as a safeguard against bureaucratic encroachment. I am heartily in favor of modernization of our outmoded claim-patent system."

Alan M. Bateman, Yale consultant of Kennecott Copper since 1916:

"It is definitely my recollection that mining people and experts who attended the session were in agreement that an option of leasing would encourage exploration for hidden ore bodies. This was particularly true of those companies which have mining exploration departments. Some of the others were a little adverse to any changes in the mining law. As I recall it there was definite need expressed on the part of exploration companies that they needed some means such as a lease to protect them while they were carrying on geophysical and geochemical surveys. No company would wish to go to the expense of such surveys for the purpose of determining if mineral deposits exist in an area that might be claimed by anyone.

"I am definitely in support of some change in the mining laws such as a lease whereby a large enough acreage can be held for a given period of time to permit the testing by a flying magnetometer or scintillometer or other geophysical methods. Obviously this cannot be accomplished on a small group of claims. You have my permission to use my name in supporting this proposal."

D. M. Davidson, vice president and chief geologist, E. J. Longyear Co., Minneapolis, Minn.:

"* * * my testimony before the Commission was to the effect that not only was the leasing system desirable in many instances, but that actually it was inevitable. I certainly would favor a gradual transition, to wit, that the ordinary lode claim which guarantees the possessory right for minerals be maintained, but that in addition we create a new kind of claim which would be much larger and in addition, might result in a lease with the Government for minerals, such as now obtains in the case of potash, oil, and other minerals which occur in Federal ground.

"* * * If at any time I can assist in any way by testifying in person on my return to North America I shall be only too happy to express my views, for what they are worth * * *."

Senator MALONE. I am familiar with the arguments of people who advocate that because they want to control the prospector but you cannot control a prospector under the Mining Act of 1872. Under the Leasing Act there were large areas leased for oil, sulfur, and

other materials which made it necessary for us to review the problem in connection with uranium.

It became evident that uranium was located on large areas. I made a report in 1938, which was published in 1944 that pointed out the uranium deposits in Colorado and Utah. It was advisable to open this up to uranium miners. Because you could not patent a mining claim over an oil lease you will find there was an amendment adopted by the Senate validating all of the mining locations on oil leases under the 1920 Oil and Gas Leasing Act that had been located up to that time to the extent that they could not interfere with the oil leases. In other words, if a man having a prior lease wanted to drill at a certain point he would have the priority but if he was not drilling there the man could go in with his mining claim and develop uranium. That law is in operation at the present time. It may be necessary to hold hearings on the extension of the date. Perhaps it should be open ended.

RESEARCH PROPOSED TO DEVELOP PROCESSING PROCEDURES

Mr. PALEY. Further, we recommended attacks on key technological problems both in exploration and in processing. Incidentally, we were much impressed by the possibilities of new techniques for finding hidden ore bodies. Geologists told us that it was their firm belief that the ore bodies not yet discovered in the United States might well be as large and rich as those already found, but that they were hidden, sometimes quite deeply, under mantles of young rock and other materials.

Senator MALONE. Most engineers think they have not scratched the surface. They have to have an incentive.

Mr. PALEY. They have to have incentives and better instruments.

Senator MALONE. They will get the better instruments much faster if you have a policy by law that establishes a profit incentive. Government officials do an awful lot of worrying about conditions they create themselves, they create the emergencies and then try to cure them. That is what takes most of the appropriations here.

Mr. PALEY. It will take new methods to find them and their extraction may prove expensive until new techniques are developed and put to use.

To alter patterns of use, we depend of course upon industry—and our emphasis throughout was upon the role of the competitive enterprise system. We made certain recommendations for improved use of materials by the military. Also, I might point out the Government is the largest single purchaser of materials, and of equipment and goods, in the United States. The specifications it adopts have a profound influence not only because of its own purchases, but because its specifications influence manufacture for other markets as well.

Senator MALONE. I presume you have in mind our preparation for war.

Mr. PALEY. In addition to that the huge number of people employed by the Government need equipment.

Senator MALONE. The equipment they need is purchased from companies or individuals in the business if they are not in the war manufacturing business.

Mr. PALEY. Except that the Government often places specifications on materials needed by civilians in Government.

Senator MALONE. Do they place different specifications on typewriters and adding machines? Don't they take what is in the market generally?

Mr. PALEY. In some cases, say, a filing cabinet, they might specify something better than is really called for because of the use to which it is put. In many cases we found overspecifications.

Senator MALONE. We had better look into it and possibly do away with it.

Mr. PALEY. We are recommending that anybody who is in position to influence use of materials, through what he specifies in ordering should be conscious of the need to not waste materials.

Senator MALONE. We have crossed a good many trails where these people who are in the business of ordering for the Government will suddenly issue a set of specifications that can only be met by one company and then we find later that this fellow or some of his friends are either getting ready to resign or go to work for the company or his friends are with the company.

Mr. PALEY. That is dishonest.

Senator MALONE. Yes. It points to worse than dishonesty. I tried to point out in a lot of these alphabetical agencies that there is sometimes a plan to make this Government dependent on some area that is not available in wartime for something they cannot fight without. It is worse than dishonesty and that goes to the root of it. That is what this committee is charged with determining, how to make these materials available in time of war.

Any increase in the production of these critical materials in this Nation or their assured availability in the Western Hemisphere decreases the demand for a stockpile in that particular item.

Mr. PALEY. On the other hand, sir, I must point out that the recommendation that we depend on imports to a certain extent might have exactly the opposite motive. It might be made from the standpoint of trying to strengthen the economy of this country.

Senator MALONE. How would you do that? Let us take lead and zinc. How are you strengthening the economy of this country by recommending imports and that is what you are doing?

Mr. PALEY. It depends, sir, and I have not come to it yet in my statement.

Senator MALONE. Get to it and I will be interested.

Mr. PALEY. If you accept the real cost theory, to which I will come presently. That has a direct effect on the strength of our economy and I want to say the strength of our economy is the first bulwark we have against an enemy in time of war.

Senator MALONE. But we are destroying it now. So go right ahead. I will be very much interested in that paragraph.

PALEY'S RECOMMENDATION OF ABOLITION OF TARIFF AND DOING AWAY WITH THE "BUY AMERICAN" ACT

Mr. PALEY. To assist imports of critical materials which we do not produce, or do not produce in sufficient quantity, we recommended lowering tariff barriers and doing away with the "Buy American" Act.

Mr. MALONE. I have to talk about that. Let's take lead and zinc. You have done away with the tariff barrier as you call it, and I will just go with you on calling it a barrier for a minute.

It is a barrier to a sweatshop-labor product coming in and putting on the street the boys that have a higher living standard but tell me how it has increased our safety in the lead and zinc field.

Just take those two. We have about 30 others.

Mr. PALEY. May I set aside for a minute security reasons and talk about our economy?

Senator MALONE. Go ahead. I would like to know about the economy because the boys are unemployed at the moment and getting ready for unemployment insurance.

Mr. PALEY. With your indulgence, I can make a more responsive answer to your question if I can just describe—and I will skip ahead to it if you want me to—this real-cost principle which I think is pertinent to the discussion.

May I do that?

Senator MALONE. Go ahead.

MATERIAL SUPPLY PROBLEMS AND SECURITY ASPECTS

Mr. PALEY. We recommended positive steps by the Government to improve the tax position of our investors in foreign countries. We recommended continuance of technical assistance and study of means of limiting market instability.

There has been a good deal of misunderstanding about the Commission's findings in this field of market instability. I do not have to tell you about the wide swings in the prices of materials. Within a couple of years, as happened in the late 1930's, prices may soar 100 percent and then fall off again to below the starting levels.

Senator MALONE. That happened when the English sent in a stockpile of lead and zinc last year and remember we furnished the money for them to buy it with in the first place.

Mr. PALEY. That might have been the result of what I do not approve of—the two-price system.

Senator MALONE. We have a two-price system in everything. Taxpayers take the bump when we sell anything abroad because we have priced ourselves out of the market through inflation and other ways.

Mr. PALEY. I am talking about the controls we had on prices.

Senator MALONE. Domestic controls.

Mr. PALEY. Yes.

Senator MALONE. Of course, we have to keep our controllers busy. We have it in peacetime so that we are unable to produce and then we have it in wartime so we can ration the small amount we have. Otherwise, we would have an unemployment situation here in Washington of the rationers.

Mr. PALEY. Clearly the greatest deterrent to such swings is a general stability of our own and the free world's economy.

But because of the way that consumer inventories are handled, and because of the lag between new demand and new or increased supply, mineral prices swing much more widely than do those of the total economy.

We saw such cycles as a major deterrent to the development of new mineral properties, and we tried to work out methods of checking such wide swings. We found no genuinely satisfactory method.

Producer countries in the past have formed cartels which operated to our disadvantage. We did not want cartels to be reborn. They limit production in order to raise prices. Our effort, it seemed to us, must be to increase production, and to hold down costs.

But we could not see our way clear to make a recommendation in this field. We did suggest that international multilateral contracts, and buffer stock agreements which include both materials consumer and producer countries, might be worth a cautious experiment for a few materials. But I must say I have misgivings about such arrangements. We hoped, however, to start discussion in this field, so that the creative minds of industry could work toward solutions of this very serious problem.

In broad outline, and obviously with many omissions, I have sketched the materials problem as the President's Materials Policy Commission saw it, and some of the recommendations that we shaped for our long-range needs.

The security aspects of materials supply are a problem within this larger problem. Obviously, the greatest contribution we can make to our own national security is to build and maintain a strong and growing economy, and to help our allies be strong. Where minerals are concerned, this means a vigorous mining industry. One of our most important resources in time of war is the massive production machinery of the country.

REAL COST PRINCIPLE

Now here I would like to talk briefly about real costs, an important element in economic growth. I find real costs a difficult concept, but something which must be understood in analyzing the factors which make for strength in the economy.

The individual businessman or consumer thinks of costs in terms of the dollars he must pay, under existing levels of prices and wages, to secure a given amount of labor, materials, energy, and so on. In inflation, such costs rise; in depression, they fall. These costs are vital economic factors, but they differ sharply from what we term real costs. Real costs are measured in the amount of labor, the amount of capital investment it takes to produce a pound of material or a unit of energy. For instance, if the quality of the ore declines, it will take more man-hours of work, or more capital investment in machinery or new processes or both, to produce a pound of the finished metal.

Senator MALONE. Are you taking it for granted, if we do continue to mine our own metals the quality of the ore will decline?

Mr. PALEY. It has declined considerably.

Senator MALONE. Is there a record you have compiled to show us it has declined?

Mr. PALEY. Yes, sir.

Senator MALONE. I will be interested in seeing that.

Mr. PALEY. At one time we had richer copper.

Senator MALONE. Only a small amount. We never had the amount of copper we have now at a lower cost.

Mr. MASON. We had in the report statistics dealing with the average grade of ores mined 30 or 40 years ago in copper, lead, and zinc compared to what they are now.

Senator MALONE. Do you have any information on the costs?

Mr. MASON. I am just talking about the grade of ores.

Senator MALONE. I want to point out to you that the difference between country rock and ore is many times just a better method of beneficiating it. Right at the moment the University of Nevada has a project I was able to install to determine through their investigations and laboratory work better and improved methods, new and improved methods of beneficiation of uranium ore and it is not the only project in existence. We think it will take the same path as copper, zinc and all the rest of the metals.

Mr. MASON. What I really want to say was there are in the report statistics on the average grades of ore mined in the United States 30 or 40 years ago.

Senator MALONE. Compared to costs?

Mr. MASON. Compared to now. The report indicates technological changes in the American mining industry——

Senator MALONE. So you can look forward to many of the low-grade deposits known now and many that will be further discovered as being turned in to as high a grade ore as any of the rest of it but the cost probably will not increase much if the profit incentive is there. It is not there now, I want you to comment on that if you think it is. Now they are not trying to work it out. They are trying to get out of the business because there is no incentive to stay in it. The reason you discovered these methods was there was a mining engineer, I know his name so well, I think he is still alive, that came up out of a laboratory with a method of using less than one-half of 1 percent copper and making a profit at the same price they used to get for 6 or 7 or 8 percent copper.

I will insert the name (D. C. Jarkling) because it is sacrilegious for any engineer not to remember the name of this man. He made country rock around Ely, Nev., and Utah, Montana, and Arizona into copper ore.

We have not reached the end yet. But you have reached the end and you would not have had that process if you had what you now have. Imports of copper from Africa are practically duty free where you have 40-cent labor and still have the higher grade copper. You have destroyed the American industry. They are laying miners off out there so fast now there is hardly room on the streets.

They are producing 1,400,000 pounds of copper at Bingham per day using an ore with a copper content of only 0.607 percent. That is less than 1 percent. Yet they are starting to close down now, how-

ever, just like they are in Ely, Nev., and in Montana and in Arizona. That is only one industry. There are 500 others.

PRODUCTIVITY COSTS

So the reasoning that you have in here is the thing we question. I want you to support your position.

Mr. PALEY. Thus in real costs we are really talking about productivity—the output per man-hour, per dollar of capital investment, of the economy. We are measuring the production potential of the country. It is because through the years we have been able to produce more and more goods with a given amount of labor and capital that our standard of living has been able to rise. Our standard of living can continue to rise only if we continue to make steady gains in reducing the real costs of the goods which we produce.

Senator MALONE. Then you will agree what you need is an incentive for private money to go into the laboratories for inventions and research to discover those methods.

Mr. PALEY. I agree with that, absolutely.

Senator MALONE. That is a long step ahead.

Mr. PALEY. As I say in our report we laid very strong emphasis on the need for technological advances, and made many suggestions as to how we thought they could be accomplished. I said sometime ago that we probably could produce almost every material that we need in this country at a cost. But that cost could easily be prohibitive. That is why the Commission felt that we would be wrong to strive for self-sufficiency regardless of cost.

Senator MALONE. At that point let me ask you once more do you agree as Chairman of the Commission, that there should be a protection to the producer in this country equal to the difference in the wages and taxes after giving consideration to our greater efficiency in order to keep him in business and to create and maintain an incentive for private capital?

Mr. PALEY. Senator, looking at the economy in the round now, not talking about any individual industry, I say that if we can get material from abroad—I am putting aside now security reasons and I will come back to that—if we can get material abroad at a lower cost than we can produce it here this would allow our industrial machinery to produce finished goods at lower cost and increase our consumption of those goods. We would have a stronger economy than if we use our own labor to produce those same materials at a higher cost and, in so doing, take that labor and capital away from other material or other products that could be produced with higher product value.

Senator MALONE. I think you have now come to the meat of your whole report.

Mr. PALEY. I told you sir, that this real cost principle was very important.

Senator MALONE. That is right, and I am very happy that you have because you have said to us now that regardless of labor, regardless of the taxes they pay in any other foreign nation that if we can get the material cheaper we should send it in here. That would include lead, zinc, and copper and the 77 products that we are particularly investigating and also farm products. With our guaranty of certain price supports we are supporting the price in Canada and other na-

tions. You are saying to us that we should let the free competition operate and then when our men are unemployed, that would prevent of course developments in these areas where the development has taken place over the last 100 years; we should put those men in a more productive industry manufacturing material and then the entire economy would be strengthened.

Mr. PALEY. I say that is the course we should follow with the exception of considerations we must give to our security problem. There, I think, very important exceptions have to be made because naturally we have to know——

EXCEPTIONS TO REAL COST THEORY

Senator MALONE. Go on and make the exceptions.

Mr. PALEY. I would like to make that now. This theory I have been talking about excepts those materials we need for reasons of security.

Senator MALONE. Well, that would mean the 77 materials this committee is investigating. You would leave them out of that category?

Mr. PALEY. Not in all cases because I think——

Senator MALONE. Have you a list here, Mr. Alderman?

Mr. ALDERMAN. Yes.

Senator MALONE. I want to furnish you with a list when you finish your statement.

Mr. PALEY. I think I can finish this up now.

If we insist on being self-sufficient instead of importing when it is more economical to do so, it will cost us heavily in man-hours of work, or in investment or both.

This would mean that manpower and capital were diverted from other lines of work with higher product value. If we do this on a very extensive scale, we will weaken our economy, and reduce our potential for war or peace.

Clearly for security reasons, there are some cases in which we must accept these higher costs. In other words, in those cases where "going production" is vital to use in case of war we should have arrangements for the continuous production of these materials even though the results would be higher "real costs." It was the feeling of the Commission that high tariffs were not the best mechanism to maintain the production of those key materials.

Senator MALONE. You are right, sir, on the high tariffs but it does not touch the subject. No one seems to know anything about the business of tariffs except the people who want to do away with all tariffs and that includes all the special columnists and writers in the country.

Mr. PALEY. It was mentioned to us, sir, in our investigation by people who thought it was necessary for us to keep——

Senator MALONE. Did a producer tell you he wanted high tariffs? Didn't he tell you he wanted that differential of cost?

Mr. PALEY. It is a matter of degree. It was certainly the understanding they wanted tariffs which would insure this country against getting supplies from foreign sources.

Senator MALONE. What they wanted was to be insured against being put out of business by the sweatshop labor countries, paying no taxes and there are several of them that pay less wages per day than

we pay for industrial insurance, unemployment insurance, and social security. You are telling us that wherever you can get these materials cheaper that you should put these people out of work here. Those who over a period of 50 or 75 years have developed this material and and then you put them in a manufacturing business that will be more highly profitable, is that what you are telling us?

Mr. PALEY. Except for security reasons.

AMERICAN INDUSTRY USING LOW-COST FOREIGN LABOR ABROAD

Senator MALONE. Here is Mr. Ford. I have no quarrel with Mr. Ford and I am not mentioning his name suggesting that he is trying to do anything to hurt this country. He is following out the policy that Congress and the administration have laid down. He is an industrialist. I only blame the Congress that makes it advisable to do it. But do you think you can manufacture an article here cheaper with the same machinery than in a place where the wages are maybe 25 percent of what they are here? Do you think you can do it cheaper when you have the same machinery and the same know-how and with American superintendents, and I call them shifters that train this labor? How long do you think you will be in business in this country?

Mr. PALEY. You are taking an awful lot for granted when you say the same efficiency of labor, same know-how——

Senator MALONE. I did not say same efficiency of labor. I said 10 percent or 20 percent of the cost of the labor per hour, or per day with the same assembly-line methods and know-how furnished by the people from this country in the nature of foremen and superintendents.

Mr. PALEY. I am not a manufacturer but I know some of the leading manufacturers in this country. They know of the possibilities of the kind of competition you are talking about and are still coming out very strongly for the lowering of tariffs because they think it is very good for their business and for the country.

Senator MALONE. I think it is good for their business because Henry Ford has 26 plants outside this Nation and he says himself he can manufacture a Ford or tractor and ship it back here cheaper than he can manufacture it here and that is what you want.

Mr. PALEY. Mr. Ford is not importing many of the cars into this country.

Senator MALONE. Importing many of the cars?

Mr. PALEY. Not compared to the consumption.

Senator MALONE. The policy is there. His foreign-made Fords are in Nevada.

Mr. PALEY. I cannot imagine Mr. Ford would be for a policy which would in the long run shut down his factories in Detroit in favor of factories in England.

I should think Mr. Ford would be on the side of the high standard of living in this country because it is good for his business.

Senator MALONE. He ships these Fords back and says he can make a Ford or make a tractor and ship it back here, a usuable tractor much cheaper than he can do it in this country.

Why doesn't he keep them over there. I am not blaming Mr. Ford. I am blaming the Congress that makes that profitable.

Mr. PALEY. I certainly have to give to Mr. Ford and a number of other important industrialists——

Senator MALONE. Mr. Coleman of Burroughs Adding Machine and Hoffman of Studebaker are now putting plants in Japan. I have been in Japan and all the other countries where they were paying 15 cents an hour for labor, when I was there. A Japanese is a good workman. You can ship any car back here, you can ship any piece of machinery—the machine tool business is getting hurt right now by imports from Belgium and other countries because they have our machinery and mostly it has been paid for by the taxpayers of this country through the Marshall plan, ECA, and Mutual Security and all the other trick organizations. A worldwide investment field is what a good many of them would like to see. I would like to see it, too, but on the basis of fair and reasonable competition. You have just told this committee that wherever you can get this material cheaper if you can manufacture a tractor cheaper in England or Scotland with cheaper labor and send it back here, you are in favor of it.

Mr. PALEY. I was talking about raw materials.

Senator MALONE. Let's talk about the tractor.

Mr. PALEY. I do not think American industry on the whole—and I am not an industrialist—would have any concern whatever about competing against manufacturing processes and manufacturing companies in foreign lands. I think our industry has proven to the world that it is the most efficient and economical system of production yet devised by man and it is doing awfully well.

Senator MALONE. Are they?

Mr. PALEY. I have been told so.

Senator MALONE. We have different information. The sewing-machine business is being cut down materially. Have you investigated any of it lately?

Mr. PALEY. No, I have not, sir.

Senator MALONE. If you haven't, I see no use of going into it further but if you want to, the information would be very interesting. Sewing machines come from Japan. I had one on one corner of my desk one day and one on the other corner. Fifteen feet away they looked like and they were guaranteed to do the same work. The maker's name was underneath the Japanese machine. By casually examining it the housewife would not know the difference. One sold in the market at wholesale for $77 and the other for $22.

CURTAILMENT OF PRODUCTIVE CAPACITY REDUCES STRATEGIC EFFECTIVENESS

The difference in labor cost makes that difference. That is the story of your manufacturing business. I see no reason if you apply it to raw materials, why you do not apply it to everything.

Cut it all off and let the world compete and divide our markets with them.

As long as it does not hurt your national defense. Certainly sewing machines are not going to contribute an awful lot. You will have plenty of sewing machines to make uniforms.

Mr. PALEY. I do not know if we have enough sewing machines. I cannot comment.

Senator MALONE. You do not know much about mining?

Mr. PALEY. I had an opportunity for 17 months to learn more than I did when I started out.

Senator MALONE. I hope you will learn more about it as you go along.

Mr. PALEY. In some cases, provision could be made for extra sources of material through stockpiling and creating standby capacities as a means of closing the gap between supplies and requirements which would develop in wartime because of drastic increases in demand and because of curtailment of supply by enemy action. However, where such provisions are not adequate, other devices could be used, such as direct subsidy or long-term purchase guaranties.

We recommended that where cuts in tariffs would cause distress in industries, that the tariff changes take place only gradually and that the Government take steps to assist those industries and labor forces. We did not spell this out with great detail. That was not part of our assignment.

Senator MALONE. Would you try to treat a workingman that had grown up in a business, maybe 2 or 3 generations in mining or 2 or 3 generations in a production industry, and have the Government take care of him in some manner?

Mr. PALEY. I think that, in distress areas, not only because of what tariff does to an area but also because of what happens to areas through other dislocations, the Government from time to time has responsibility. Employment services can be instituted. Maybe in some cases a new industry can come into a town and take up the labor. Maybe financial accommodations can be made. Maybe depreciation rates can be set at a higher level, or other incentives used to help labor or capital in a distress condition.

Senator MALONE. For 175 years this country has grown with individuals in competition with each other within the United States. In other words, until the last 20 years, young people could start a business or form a corporation and go into any area in the United States whether in the backwoods of Michigan, or in the mountains, or in the desert and establish themselves. If they had developed a new process or a new idea or found some materials they were in a position, after studying the market and the production problems, to sell stock or secure backing from their friends and start their own venture. If their judgment proved to be right they were in business, were they not?

Mr. PALEY. Yes.

Mr. MALONE. You approve of that sort of competition?

Mr. PALEY. Yes, sir; I do.

Senator MALONE. Now, until the last 20 years, to complete that affair all he had to do was to study the other areas of the United States.

He knew he was going to have to pay the going wages. If they were not the same to start, they would be the same soon because information travels fast.

If the taxes were not the same as they were anyplace else they soon would be so. He had an even break with every producer in the United States. All he had to have was a little lead somewhere, raw materials, or market availability.

Now because he knew that the policy of the United States was a tariff policy that made up roughly the difference between the wages and taxes and other factors between the chief competing nation and our wages, he did not have to worry about it. A Japanese sewing

machine paid enough duty to put it on his basis. A pound of lead or zinc had to pay enough duty to put it on his basis. But in 1934 by a congressional act that many think is unconstitutional, the responsibility of the Congress was transferred to the Executive, and then a political factor was injected.

For the good of the overall economy, which you so ably described, you can take him out of the mines or any other activity and make him more productive, he now not only has to study the competition in the United States, but in the other 75 nations—what they might do in competition, does he not?

Mr. PALEY. Yes, sir.

Senator MALONE. Do you think that is the way the country should be run?

Mr. PALEY. I think that this man's capital, this man's energies and the labor he might employ should be put to those uses that might be the most productive for him and for the country.

Senator MALONE. Even if he had to go out to South Africa to do it?

Mr. PALEY. No. I do not say that. There are not plenty of opportunities in this country for young men.

Senator MALONE. What are they if you have a free-trade theory? Name some of them and I will give you time to send in a list because we have studied it. You cannot even make titanium here as cheap as you can in Japan. You can't make an airplane that can outfly other planes without it.

Mr. PALEY. We seem to be at the highest level of our productivity.

Senator MALONE. Maybe you have not studied it. I made a talk on that last week on the Senate floor.

Mr. PALEY. We are suffering a slight recession now.

Senator MALONE. What do you think caused it?

Mr. PALEY. Certain dislocations that occur from time to time. I cannot find any proof that this recession, this mild recession, has been caused because of our so-called tariff policy. I know the highest tariff policy we ever had in this country was before 1934 and I think the most dangerous depression period we have had in this country was then.

Senator MALONE. The Smoot-Hawley Tariff passed the following year after the depression hit. I suppose you knew that?

Mr. PALEY. Yes.

Mr. MASON. Passed in 1930.

Senator MALONE. Yes. The depression came along in 1929 and was in full force. And never was cured until we got in World War II.

Now, with your free-trade policies you had two wars. You have had WPA; when the war came along, in 1940, we had 9 million unemployed and 17 million partially unemployed. You never cured anything. When the war came, in 1950, you had 5 million unemployed and 9 million partially unemployed, and Mr. Sawyer said a couple of months later—we sure cured that unemployment situation.

You need another war to put the men back to work. From what I hear, maybe we are getting into it. There are people that advocate it. We think there that we have to protect Indochina and the Malayan States to get tin and rubber.

TIN AND RUBBER SITUATION

We do not have to protect anybody except the Western Hemisphere to get tin and rubber. We have as much tin ore in South America as you can ever use in the Western Hemisphere in the foreseeable future. Do you know where it goes now? The top ore goes to Europe, goes to England, to be refined, and comes back to us. It crosses the ocean twice, but it could not make one crossing when war starts.

Mr. PALEY. We do a certain amount of smelting now.

Senator MALONE. Not much. I made a report on the smelter to the Senate Military Affairs Committee. I was consultant in 1942. It was built in Texas. It was a good location. Jesse Jones happened to be head of RFC. It was a good smelter but it did not get the first-grade ore, and it is not getting it now. They are talking about shutting it down now, making us totally dependent on refined tin from England that gets ore from the Malayan States and South America.

The thing is silly, when you follow it through to a logical conclusion.

We will recess now until 2 o'clock. I, unfortunately, have an appointment at 12:30.

Mr. PALEY. I have a few more paragraphs.

In closing, I would like to emphasize one aspect of materials security. While we depend upon our strong economy to win wars, we must also recognize the importance of the economic strength of our allies.

TRADE POLICY OF THE ADMINISTRATION

The President, in a recent message to the Congress on foreign economic policy, laid especial emphasis on the importance of actions that would help both us and our allies.

If we fail in our trade policy—

he said—

we may fail in all. Our domestic employment, our standard of living, our security, and the solidarity of the free world are all involved.

For our own economic growth, we must have continuously expanding world markets; for our security, we require that our allies become economically strong. Expanding trade is the only adequate solution for these two pressing problems confronting our country.

May I add that trade in raw materials is an important part of the world trade, the economic growth, the national security, at which we aim.

Senator MALONE. Very good. We will be back at 2 o'clock.

(At 12:30 p. m., the committee recessed until 2 p. m.)

AFTERNOON SESSION

Senator MALONE. The committee will be in order.

I was very much interested in your last statement toward the later part of your statement. This is a very pertinent statement. I noticed on the ticker that Mr. Stassen said almost the same thing to a committee this morning that you said to this committee. He said that we should get materials where we can get them the cheapest regardless of

what effect it has. But he also said the Government does have some responsibility when men are out of work. On page 11 of your statement, next to the last paragraph:

> We recommended that where cuts in tariffs would cause distress in industries that the tariff changes take place only gradually and that the Government take steps to assist those industries and labor forces.

What do you mean "assist those industries"?

STATEMENT OF WILLIAM S. PALEY—Resumed

Mr. PALEY. It seems if any area is affected adversely because of——

Senator MALONE. Area or industry?

PROBLEMS SURROUNDING DISTRESSED LABOR AREAS

Mr. PALEY. I was talking about the industries that are in an area. Where the industries or the labor forces suffer directly because of tariff changes and where it appears that the decline being suffered by those industries and labor would be of longtime duration, the Government might take such steps as would be helpful toward giving relief to the particular industries and labor forces involved.

I think this morning I mentioned that the introduction of employment services through which people could find employment in other areas might be one means.

Another means might be Government help to finance a new industry going into that particular area in order to take up the labor force that might be left idle for a long period of time.

As I said this morning I have not thought out carefully the various things which Government might do in such cases but I am sure there are other ways by which the Government as such can be helpful.

Senator MALONE. If these industries should close down or cut their employment in half, whether you trade 10 percent of an industry to some other nation in return for some political favor or advantage, or half or all of it is gone, then you think the Government owes the area something to take up the unemployed and perhaps pay their transportation and other expenses to go to some other area?

Mr. PALEY. I am not sure how far I would go into it. As I said, I have not given it too much thought. I would like to say I think this approach applies not only to areas that might suffer because of changes in our tariff. It might be the sort of arrangement Government might want to apply in cases where serious dislocations take place for other reasons.

Senator MALONE. It might. The Government might take up the load even where through inventions and laboratory experiments the load was shifted in the United States even though it was not done by unfair foreign competition or by sweat shop labor, or any other kind of competition outside of the United States, it might just be that if titanium metal goes far enough and some think it will, it will decrease the use of stainless steel. The Government would then take these men and put them in another area. Is that what you are advocating?

Mr. PALEY. I am not talking about gradual changes but rather sudden changes where a large or small labor force might suddenly find itself in distress for reasons beyond its control. I think the changes

you are talking about now are gradual ones that do not necessarily spell out a state of distress.

Senator MALONE. I am not so sure the changes you talk about are beyond their control. I think they will keep a lot of people home some day when the changes are brought about whether they are Democrats or Republicans. They thought they were keeping them home in 1952. Apparently with our continuation of the New Deal policies, they did not keep the right ones home.

LATITUDE OF STATE DEPARTMENT IN ADJUSTING TARIFF RATES

Mr. PALEY. It is quite obvious we have a difference of opinion which I would like to characterize as being an honest one. I happen to subscribe to the trade policies which were recently enunciated by the President.

Senator MALONE. Mr. Roosevelt?

Mr. PALEY. I am talking about the ones——

Senator MALONE. These are the same policies, the extension of the 1934 Trade Agreements Act—how are they changed if you extend it?

Mr. PALEY. I suppose the changes would not be marked, or at least I cannot point——

Senator MALONE. How would you change it—just how would you change it to improve it?

Mr. PALEY. To improve it from what standpoint?

Senator MALONE. From 1934.

Mr. PALEY. All I am saying is that one has to regard such things in the light of conditions at the time he is trying to apply a judgment.

Senator MALONE. What are the present-day conditions? That would be very helpful if the committee know.

Mr. PALEY. To finish—I would like to go back to that if you want me to—I think that the program outlined by President Eisenhower in his message to Congress is a sound one.

Senator MALONE. How does it differ from the 1934 Trade Agreements Act?

Mr. PALEY. It differs, I suppose, to the extent that he wants power to reduce tariffs even further.

Senator MALONE. The principle is exactly the same, then?

Mr. PALEY. Yes.

Senator MALONE. In other words, Mr. Roosevelt asked for the 1934 Trade Agreements Act so he could use his own judgment through the State Department as to what was good for the national economy and make trades out of hand without the Congress having any check whatever. President Truman asked for a further extension and got that, and President Eisenhower is asking for 3 years more. What is the difference?

Mr. PALEY. As I say, the only difference I can recall immediately is that he wants——

Senator MALONE. Greater freedom in lowering tariffs.

Mr. PALEY. Yes, sir.

Senator MALONE. Didn't the 1934 Trade Agreements Act permit a 50-percent tariff change, that is they could have raised them 50 percent but they never did on anything I heard of, and they could lower them 50 percent?

Mr. PALEY. That is my understanding.

Senator MALONE. Later didn't it give them another 50 percent?

Mr. PALEY. I am not sure, I think there was an amendment which gave a further degree of latitude.

Senator MALONE. For your information, it was 50 percent. That meant that when they gave it a further 50-percent cut, it resulted in a 75-percent total cut. Inflation has accounted for a further reduction of at least 60 percent. As the purchasing power of the dollar dropped and American wages rose in accordance with our inflation, a set tariff or duty of so many cents per unit represents a lowered rate of protection. Any tariff other than an ad valorem levy loses its effect with inflation. That is true, is it not?

Mr. PALEY. Yes.

Senator MALONE. In other words, if there is a 5-cents-a-pound tariff on a 20-cent item, the tariff is at a rate of 25 percent. If through inflation, the cost of the item becomes 40 cents, the 5-cent tariff then represents only a rate of 12½ percent. So, as a matter of fact, after lowering the tariff itself 75 percent, and then reducing its effectiveness by at least 60 percent because of inflation, you do not have very much left do you?

Mr. PALEY. It certainly is a downward grade.

Senator MALONE. It would be a pretty steep hill if you are pulling it with a Ford automobile, would it not?

Now on that basis, we do differ. I differ with you, but what I want is your ideas in the record and I think we are getting them. Under this original act, tariff changes are lefe entirely in the hands of the Executive. He can do just what you have described.

If he does not get the extension, it expires on June 12 this year, is that right?

Mr. PALEY. Yes.

Senator MALONE. Now do you know anything about the general agreement on tariffs and trade made at Geneva?

Mr. PALEY. I do not think I know enough about it so that I could comment on it with authority.

INTERNATIONAL TRADE ORGANIZATION

Senator MALONE. Do you know anything about the International Trade Organization that was proposed to the Congress which Congress did not accept? Are you familiar with that?

Mr. PALEY. I was. My recollection is not thorough.

Senator MALONE. Wasn't it a situation where you would have the 50-odd nations, whatever it is, arrange for just what you described, at one point in your testimony. Under chapter 6 of the charter for the ITO you could attempt to prevent variations in price through a world cartel agreement and what did you call it instead of a stockpile?

Mr. PALEY. Buffer stock arrangement.

Senator MALONE. Which would mean you would just take up the surplus when it was there in some kind of stockpile?

Mr. PALEY. I told you I had real misgivings about any such arrangement. It was suggested as one means through which world prices could be stabilized.

Senator MALONE. But did you agree with the International Trade Organization's suggestion of stabilization through the means proposed by them at that time?

Mr. PALEY. No, sir; I have never been in agreement with any sort of international arrangement where prices could be controlled either by agreement, cartels, buffer stocks, or any other device.

Senator MALONE. Are you familiar with the International Materials Conference organized in the State Department to take the place of the International Trade Organization when it was refused by Congress?

Mr. PALEY. I knew of the existence of the——

Senator MALONE. You did not agree with that arrangement?

Mr. PALEY. I did not know enough about it at the time and I am not sure that many people did. As I understand it, there were very serious shortages of raw materials throughout the world following outbreak of the Korean war, and representatives of various countries came together for the purpose of trying to make allocations based on their being used to the best interests of the Allies' war effort.

Senator MALONE. Well, the General Agreement on Tariffs and Trade was based in general on the 1934 Trade Agreements Act. Without the 1934 Trade Agreements Act there is no basis for any agreement so far as we are concerned; is that right?

Mr. PALEY. That is right.

Senator MALONE. Did you agree with the idea of entering into this General Agreement on Tariffs and Trade on the basis of that act?

Mr. PALEY. Are you talking about the original act of 1934?

Senator MALONE. The General Agreement on Tariffs and Trade was made by a number of foreign nations and ourselves and I understand we are the instigator of it. They say we are bound by it. I will not get into that for a while, even though Congress never accepted it.

The General Agreement on Tariffs and Trade was a basic arrangement agreed to at Geneva for organizing all of the nations. The Trade Agreements Act was simply used as a pretext of congressional approval which it never did receive. The International Materials Conference divided the free world's supply of certain materials among the nations of the world on a basis of entitlements for consumption, whatever that means. Did you ever hear of that phrase?

GENERAL AGREEMENTS ON TARIFF AND TRADE

Mr. MASON. I do not think the International Materials Conference has anything to do with the General Agreement on Tariffs and Trade that you spoke of. The International Materials Conference was merely an advisory board set up, I believe, in 1950 after the Korean war started, when we were confronted with material shortages.

The International Materials Conference made recommendations to various governments as to how the available supplies of materials should be allocated to the various countries.

It had nothing to do with tariffs at all.

Senator MALONE. Of course not. You did not need tariffs. If you had the authority to take all the production in the world and all the estimated consumption and divide it on entitlements for consumption, you did not need a tariff.

Mr. PALEY. I would like to make two points.

Senator MALONE. You can take it away from us and give it to somebody else.

Mr. PALEY. Assuming the United States Government agreed?

Senator MALONE. They did not have to agree.

Mr. PALEY. The report only made recommendations to the Government.

Senator MALONE. Who was the government in that case?

Mr. PALEY. I suppose it is the President under what powers he had given to him by Congress.

Senator MALONE. Operating through that organization they could do it by Executive order.

Mr. PALEY. The President didn't operate through that organization. He received advice from it and he could act on that advice or not act on it as he saw fit.

Senator MALONE. He could do it.

Mr. PALEY. Within the limits set by Congress.

Senator MALONE. Congress did not set any limits and they refused to take the International Materials Conference and for your information, I think it is going to be very interesting for you as we have placed the internal State Department documents that led up to the organization in the record.

Mr. MASON. Interdepartmental committee reports.

Senator MALONE. Yes; whatever you call it. I have other names for it. But it took the place actually though they denied it was for that purpose of the International Trade Organization which was put before Congress but for which approval was refused. It did, didn't it?

Mr. MASON. My opinion has always been that the general agreement on tariffs was an agreement within the limits that Congress had permitted under the Trade Agreements Act.

Senator MALONE. Then you agree exactly with what I said at the beginning of the discussion of the general agreement. Without the 1934 Trade Agreements Act GATT would have been impossible; would it not?

Mr. MASON. Yes.

Senator MALONE. If the Trade Agreements Act is not extended beyond June 12, what becomes of GATT?

Mr. MASON. I would say the power to make such agreement disappears.

Senator MALONE. What becomes of the agreements already made?

Mr. MASON. I am not sure about this. I would suppose they would terminate.

Senator MALONE. I would hope so. I wanted to complete Mr. Paley's testimony first. I did not intend to digress.

Now what do you mean that for our own economic growth we must have continuously expanding world markets?

Mr. PALEY. Is that a quotation from President Eisenhower's statement?

Senator MALONE. You say that, but what do you mean by it? You have it in your statement.

Mr. PALEY. I mean by that, sir, that in order to get the materials we need at prices which would——

Senator MALONE. You mean sweatshop labor prices?

Mr. PALEY. I am talking about prices now without characterizing them.

Senator MALONE. Let's get that clear. Do you think we ought to favor foreign prices when they are below ours because of the differential between wages here and the taxes and other important factors? I think you said you did before but let us make it clear.

Mr. PALEY. I said before and I will repeat, sir. I believe in the low real cost principle but without making tariff changes that are too drastic—in other words, I would plead for gradualism.

EFFECT OF LOW TARIFFS ON THE DOMESTIC ECONOMY

Senator MALONE. Throw them out of work gradually?

Mr. PALEY. I would lower tariffs where the lowering of tariffs will allow our economy to come by materials at cheaper costs than ours.

Senator MALONE. That is what you mean, regardless of wages or taxes, or anything, you should receive those materials in this country?

Mr. PALEY. Receive those materials on the theory that in doing it, we would strengthen our economy and make it grow faster and stronger. The exception I make is that we should not apply that where security factors are important. In other words, if it is clear to us that there are certain materials which we would need during times of war from domestic production because we could not get them from foreign sources, then it seems to me it would be important to have some arrangement through which domestic production could continue even though the cost of that domestic production was higher than the cost of foreign production.

Senator MALONE. I will hand you a list of materials and ask you which of those materials you think we should import at the lowest cost possible, regardless of any differential in wages or taxes or other factors that affect the standards of living.

Mr. PALEY. The exceptions I would make are those materials which, as I said a minute ago, we would want to keep in production in this country because of security factors. Outside of making exceptions because of the security factor, I would recommend the gradual reduction on tariffs.

Senator MALONE. I think you are improving. Now just glance over it hastily and see if there are any of those materials you would throw into that list?

Mr. PALEY. Which one?

Senator MALONE. The ones you would get the cheapest you could get them wherever the source is?

Mr. PALEY. I would have to have much more information than I have. The answer to that question would depend largely on what our Military Establishment would tell us about the safety of the channels of communication.

STRATEGIC VALUE OF ATTAINING SELF-SUFFICIENCY

Senator MALONE. We have been told that and I will tell you what it is. We have had General Wedemeyer, General Fellers, General Johnson, of the National Defense Department here and we have had Anderson who is head of the Navy Department now assistant to Wilson, and Mr. Wilson himself. Mr. Wilson did not attempt to go into detail. All of their testimony was in executive session. I am quoting the summation of this material, which was to the effect

that the Western Hemisphere will be the dependable source of these critical materials in time of all-out war. Naturally any production of these materials that we can get in this Nation would to that extent create more safety because, even the transportation from South America for a while will be a little hazardous but it can be whipped. They said that any transportation of any of these materials coming across a major ocean will be very hazardous and most of them used the word "problematical."

Then these are the strategic and critical minerals and materials. Then you would leave this list out?

Mr. PALEY. Sir, am I to understand on the basis of Western Hemisphere self-sufficiency, and according to theories which you have expounded, that we would not have tariffs against materials which, for instance, could be found in South America?

Senator MALONE. Bring them in on the same basis of free and reasonable competition. That is the only way you could increase your own production unless you go to a direct subsidy for each one. I don't think Congress will approve a subsidy plan. If that was done by the state departments or by any other Department by Executive order it would not instill confidence in our private investors so they would start searching for these materials. What you have done with your policy already, is to cut the production of lead and zinc each from about 750,000 tons a year to about 450,000 tons and you can cut it again if you keep it up. The policy followed, of course, is the one that you just enunciated; that you get it where you can get it the cheapest.

However, I want to say to you that we have 15 or 20 contracts that GSA has made with producers in Africa, parts of Asia, and I cannot say in every case but in most cases they pay more for some reason in the cheap labor areas under these contracts than they do at home.

You mentioned copper. We just got through paying 30 cents a pound for 100,000 tons of copper from Chile. We guarantee our own United States companies in Government contracts not more than 25 cents. There may be a contract or two at more than that but most of them are as I say, around 25 cents.

Mr. PALEY. I thought copper was selling around 30 cents.

Senator MALONE. What it is today I cannot tell you. It is well under 30 cents.

Mr. ADLERMAN. Twenty-eight and a half.

Senator MALONE. We pay foreign producers more than we do private producers as a general rule. Can you explain that situation when the consumers are supposed to get the benefit?

Mr. PALEY. I do not know if I can—I do not know enough about it. I cannot attempt any explanation.

Senator MALONE. You have no knowledge of this but I will tell you for your benefit that it will be published very soon. The reason we have asked you to come down is to learn whether you agree with these principles or not that came out of the 1934 Trade Agreements Act. They knock our own production down and then pay more in many cases, than you pay here for foreign material even though the wages are very low and there are practically no taxes abroad. Under the recommendations of the Commission supported by the statements that you have made here today, the consumer does not get the benefit for some reason. It is like a gasoline war. You remember the gasoline wars when there was a station on every corner. Everyone tried to cut

the price of gasoline a few cents a gallon but after all the stations but one had disappeared, the price went right back up. That is what happens all over the world to Uncle Sam. So your theory does not work out. But that is something you would have to study yourself. What about these expanding world markets?

Mr. PALEY. I do not quite know what you mean.

Senator MALONE. "We have to have continuously expanding world markets." You believe that or you would not have put it down.

Mr. PALEY. Yes, sir.

Senator MALONE. What is your theory of trade to have an expanding world market?

Mr. PALEY. I think an expanding world market strengthens the economies of a lot of countries throughout the world.

Senator MALONE. Would you call an expanding world market for American products having American producers send their plants to the foreign countries?

Mr. PALEY. If the establishment of their plants in foreign countries can act to stimulate industrialization in those countries and act toward increasing their industrial strength—and I presume they are allies of ours or countries which can be put into the free-world category—I would think that would be a positive step in the right direction.

Senator MALONE. And then have free trade so that they can send their stuff back cheaper than you can manufacture it here, do you believe in that, too?

Mr. PALEY. I believe the free competitive factors which most of us believe in very thoroughly should be allowed to influence markets.

Senator MALONE. There should not be any effort to use any aid to make up the difference between the great standards of living here or taxes or any of the factors; you really believe in free trade, just throw all the tariffs off and let it all come to its own level.

Mr. PALEY. I believe in freer trade, as you describe it, within certain limits, sir.

Senator MALONE. What are your limits?

Mr. PALEY. One limit, of course, would be those factors which have to do with your security position.

Senator MALONE. You would not believe in free trade then in any material that is listed by the Department of Defense, as a critical material in time of war?

Mr. PALEY. It would depend on what arrangements we could make by way of protecting ourselves.

Senator MALONE. Let us get clearer on it. You would not believe in free trade for any category of material that you would be getting from an area not available to us or problematical in case of war?

Mr. PALEY. I would believe in free trade in all materials except those which, in case of war, we would not have in sufficient supply or a material on which we were not able to protect ourselves through other arrangements from the standpoint of war demands. There are other arrangements.

Senator MALONE. What other arrangements are there except stockpiles and keeping transportation lines open?

Mr. PALEY. Stockpiles.

Senator MALONE. Can you have a stockpile for 50 years or 20 years, 10 years, or 5?

Mr. PALEY. No, sir. Somebody, and that would be the Department of Defense, would have to make some estimate as to the amounts of certain materials they would need in case of outbreak of war. That amount would depend on certain factors, on what the availability might be outside this country; on what length of time might be necessary for the establishment, for instance, of similar production of similar materials in this country even though the costs through the establishment of our own production might be very high.

MINING INDUSTRY SUSTAINING FINANCIAL LOSSES UNDER THE PRESENT MINERAL POLICY

Senator MALONE. Have you any idea how long it takes to put a mine in operation?

Mr. PALEY. I know it takes a very long time.

Senator MALONE. How long do you suppose?

Mr. PALEY. Sometimes 10 or 15 years.

Senator MALONE. You would not really be getting ready for the war you are in at the moment. You would be appropriating money and using materials to get ready for the next one after that, would you not?

Mr. PALEY. There are low-grade deposits in this country which I think could be put back in production in much less length of time.

Senator MALONE. Could I give you a piece of information which I hope you will verify with men like Mr. Fletcher. The only reason you are in production right now with lead, zinc, tungsten, and some other mines is that it is more expensive to shut down than it is to run because if they shut down they have to run their pumping arrangements that may cost from five to fifteen thousand dollars a month and if they keep mining the ore maybe they are losing less than that but losing.

There are many unprofitable operations running now in the hope that Congress will again reassert its constitutional responsibility and regulate foreign trade on a basis that they can go to their stockholders and start producing.

Once they are shut down and this I know, you cannot shut a mine down and open it up tomorrow.

Mr. PALEY. I agree.

Senator MALONE. When you shut the pumps down it floods. It means if it is shut down for any period of time, and we hope we would have peace for sometime, your timbers are rotted. Caving and destruction of the mine make it cost many, many times the cost per pound or per unit of material which you would spend to keep running, and sometimes years are involved in that operation. Are you aware of that?

Mr. PALEY. Yes, I am, sir.

Senator MALONE. Then what do you mean by shutting these properties down now and having them available when the time comes, when we need the material?

Mr. PALEY. Here is an example. Before the war we did not depend on the domestic supply of mercury to a large extent.

Senator MALONE. Which war?

Mr. PALEY. World War II.

Senator MALONE. What was the situation in mercury in World War II?

MERCURY INDUSTRY CLOSED BY FOREIGN CARTEL

Mr. PALEY. As I understand it, we suddenly found it possible to take care of most of our needs through domestic production.

Senator MALONE. Do you know why? Read Mr. Williston's testimony which is available here and of course we only called him because he mined mercury all his life, just like we call some other people that are in the business like Mr. Fletcher in lead and zinc.

Now with mercury in 1940 it just happened that it had not been entirely destroyed. We had several mines operating. We were producing at a rate of 37,770 flasks annually in 1940. Now, in 1941, those mines were already operating. Demand increased and Spain shut us off in 1941 when war was anticipated. We were just like we are over here now. We were in the war for a year before we officially declared it. A note came in to me a while ago that we must protect the colonial system in Asia in order for us to get tin and rubber; so in 1941 we produced about 45,000 flasks of mercury.

In 1942 when we were in it, we did not have far to go.

We stepped up from about 45,000 flasks to about 50,000.

Mr. PALEY. That is an example of what I meant.

Senator MALONE. But the mines were in operation, they were not shut down like they are today. They are shut down now.

There is not one in operation today. We have these charts available to you and I hope you see them sometime.

In 1943 production was not increased very much more because we did not need it, we got up to about 51,900 and that is all we needed. The rest of the Western Hemisphere was producing about 2,000 flasks, in 1940 and bringing them in here. In 1941 about 7,700. In 1942 they made up the remainder of what we needed. So there was plenty of the material. In 1944 we began to close down again.

The war was over and we dropped back to less than 30,700 flasks. In 1950 we were down to about 4,500 flasks and the rest of the Western Hemisphere is in about the same situation. I point out to you that without production here you cannot expand when war comes, but if you keep in the business and keep a going concern mining industry then you can do it and that is what we are trying to establish. We are trying to find out what we have to do here to have it available.

I might point out too, that all the mercury in the stockpile is imported. There has been no attempt to keep the mines open through purchases for the stockpile. That is the general effect of the policy. We have a pretty complete record on the cartel arrangements which resulted from this policy. Under cartel arrangements, foreign producers dropped the price down to about $75 a flask and put every mine out of operation in the United States. That is the policy you are recommending. The mines are now shut down. Now as soon as the United States mines are shut down, strangely enough the price of mercury is up to $222 a flask (April 1954). Now, nobody is going to go into the mercury mining business when they know that about the time they start to operate the cartel can drop the price again and put them out of business because there is no tariff on mercury to amount to anything.

Our lead and zinc production is around 400,000 tons. Under the policy recommended by your Commission, mines are shutting down and they will not be producing that much unless Congress changes the

rules. If your policies continue, domestic production will be about half this amount next year. If mines continue to close and we get into another war it will take us 3 years before we can expand our production and get back to where we were in 1951.

Mr. PALEY. I think what happened to mercury during the war is a dramatic example of what this country, with ingenuity and energy, can do when faced with serious problems of that kind, like raising mercury production from 400 flasks a year to 5,000 is a dramatic increase.

Senator MALONE. They did not do that. They brought it up from where I pointed out it was, around 40,000 flasks to about 50,000.

Mr. PALEY. What was it a couple of years before 1940?

Senator MALONE. I do not have it here but we were in production. When you shut the mines down you are in a different position entirely.

Mr. PALEY. Senator, I would say we would have a situation where you would know ahead of time that in case of war——

Senator MALONE. Do you know now you are going into war? How far ahead do you know?

Mr. PALEY. I think we have to be on the alert for the danger of war at any time.

Senator MALONE. You are not on the alert now?

Mr. PALEY. I say we should be on the alert and I was taking it for granted we were. When it comes to those materials we need for a wartime period, which we feel we cannot get from the outside because of war conditions, then I think the industries producing those materials should have certain arrangements with Government which would guarantee the continuation of production on a going-concern basis.

HOW CAN WE ASSURE SUPPLY OF MERCURY IN PERIOD OF EMERGENCY

Senator MALONE. Then that is what you want to have with the mercury mines now. You think they should pay them enough for the mercury to keep the mines operating. An officer of the Government should fix the price and keep them a going concern?

Mr. PALEY. If it is firmly established that we cannot get mercury any other way during war, or if our stockpile of mercury is not sufficient to give us the amount of lead-time needed to reestablish the production of mercury, then I think such arrangements should be made.

Senator MALONE. But do you think that an Executive order is enough to get private money interested in a mine?

Mr. PALEY. I think the proper incentive will get private money in.

Senator MALONE. What do you think that proper incentive should be?

Mr. PALEY. What it should be?

Senator MALONE. Yes, sir.

Mr. PALEY. I think a situation which gives prospects, good prospects, of money making should be apparent.

Senator MALONE. What would be your idea? How would you do that?

Mr. PALEY. You might establish long-term contracts with certain mercury producers, for example, to buy up to a certain amount of

produce at a certain stated price—a price which, in advance, guarantees that the person producing that commodity could do it at profit.

Senator MALONE. Then you would probably have a sliding scale that takes into account any commodity-price change?

Mr. PALEY. Whatever the details are——

Senator MALONE. How long would you make these contracts for?

Mr. PALEY. That would depend on what we thought our supply needs would be.

Senator MALONE. That would be entirely up to a Government official.

Mr. PALEY. It would have to be ascertained by somebody who could weigh the necessities in each case against war conditions.

Senator MALONE. And it would be up to the Government official, State Department we will say, as to who they would make the contracts with and the term of the contract and when they terminate it and at what price?

Mr. PALEY. It seems to me when it comes to war periods or in trying to anticipate war conditions——

Senator MALONE. This is not war.

Mr. PALEY. Or trying to anticipate war that certain unnatural things are done as compared to what happens during peacetime periods, or when one is planning for only peacetime conditions. Always during war period, for instance, certain controls are imposed which are——

Senator MALONE. They are not imposed on anything you have enough of, are they?

Mr. PALEY. They are fairly often imposed on everything. Rationing becomes the order of the day.

Senator MALONE. I am sorry I must agree with you, but if you had enough of it for all needs you would not need to ration.

Mr. PALEY. Except that during the war period our demand becomes very abnormal, and the economy is not geared up to take care of those extra demands. Therefore, certain controls have to be imposed so that the war effort, as such, gets first priority.

Senator MALONE. Now let me ask you another question. You are aware, of course, that the Constitution of the United States sets down three branches of the Government.

Mr. PALEY. I am.

BACKGROUND OF ESTABLISHMENT OF TRADE AGREEMENTS

Senator MALONE. It establishes a legislative branch, an executive branch, and a judicial branch with each independent of the other. They were; weren't they?

Mr. PALEY. Yes.

Senator MALONE. It set down certain duties for each branch; is that right?

Mr. PALEY. Yes.

Senator MALONE. Do you think the Executive should demand that any of the judicial or legislative power should be transferred to him or his Cabinet or any named member of the Cabinet?

Mr. PALEY. I am taking it for granted those powers cannot be transferred without the approval of the Congress, and if they are transferred it means it was the will of Congress that they should be.

Senator MALONE. You think that is all right.

Mr. PALEY. I think it is all right for Congress, representing the people, to pass those laws and those regulations which they think act to the best interest of the Nation.

Senator MALONE. A very strong-minded President demanded of a weak Congress in 1934 that its constitutional responsibility to regulate foreign commerce and to set the duties, imports, and excises that we call tariffs and import fees be transferred to him. And it was done for 3 years. During those 3 years certain trade agreements were made. But those agreements were not referred to Congress. It is entirely out of their hands. The President starting with Roosevelt then Truman and now Eisenhower, demanded that these agreements be extended and they have so far been extended. Many believe them to be unconstitutional. I believe they are. Of course, I am in the engineering business and do not know anything about the law, therefore I can talk freely like some of the rest of you when you get in the mining business.

Mr. PALEY. Thank you for giving me this extra latitude, Senator.

Senator MALONE. I think you have it. I do not think you are responsible for anything you say because you do not know anything about the mining business and I am not responsible for what I say about the law business.

Mr. PALEY. I certainly do not pretend to be an expert but there are certain judgments I think one can apply after diligent study—not because he happens to be an expert in every aspect of the thing he is studying, but because certain facts which can be proven lead to certain judgments and conclusions. I was acting in that capacity.

Senator MALONE. I am just telling you that the premises you used to produce that judgment are not accurate, and you will find that out when we publish our report but I am giving you the chance here to substantiate what you have already said.

Mr. PALEY. If there are any facts in our report that you think are inaccurate, Senator——

Senator MALONE. I think your conclusions from the facts furnished you are inaccurate.

Mr. PALEY. If you are talking about the conclusions as not being in agreement with your own, there is nothing to be said about that. If you are talking about the facts from which we drew our conclusions, I have had no testimony proving that those facts are not accurate. Those facts were not dreamed up by our Commission. They were facts which we got from reliable people throughout the country, both Government and business.

Senator MALONE. What do you mean through your general statement by "expanding trade"?

Mr. PALEY. It is my belief, sir, that as markets become freer, our industrial knowhow, our genius for mass production, will allow this country to become stronger through its ability to make more, not only for our own use, but also for the use of people in other areas in the world.

Senator MALONE. Don't you think our expanding genius can be utilized in England or Scotland or Africa, the same as it can here?

Mr. PALEY. I think to a certain extent it has, sir.

Senator MALONE. And our own producers that have shown this disposition to go across with their plants, and more of them become interested every day, can undersell you here from those sources and as that happens does that expand our economy here?

Mr. PALEY. Well, it is my belief, sir, that they will not undersell us. It is my belief we will undersell——

Senator MALONE. They are underselling us, foreign machine tools are underselling us. We have machine tool plants down in this country now.

Mr. PALEY. I am looking upon the economy in the round, sir.

Senator MALONE. You think we are selling more automobiles on account of it?

Mr. PALEY. I am not sure.

Senator MALONE. We are not exporting as many as we did before World War II.

Mr. PALEY. From the standpoint of our entire economy we are making more automobiles for consumption and I suppose these automobiles are being used by people in this country as well as people outside our borders.

Senator MALONE. I read an interesting statement by Mr. du Pont this morning, very interesting—I thought, and I will put it in the record at this point.

DON'T TRADE FREEDOM FOR FREE TRADE

A speech by Henry B. du Pont, vice president, E. I. du Pont de Nemours & Co., before annual meeting, Virginia State Chamber of Commerce, Richmond, Va., April 8, 1954

BRIEF TAKES FROM THE TEXT

No American manufacturer can contend that the tariff should be employed to protect inefficiency or disproportionate prices. It is only on those products where wage rates are a major factor in the cost or where the material has a strategic importance that some degree of protection is necessary.

National security must not be auctioned to the lowest bidder. There are no bargains in the safeguarding of our freedom. I have no quarrel with the objective of helping our allies in any way consistent with our own interests. * * * But to deplete our own resources and weaken our own defenses is no answer, either to our allies or ourselves.

We have created an industry in this country that is a most essential element in the national security. And I doubt if we would have it today if, in the early twenties, we had succumbed to the theory that a slightly lower price, based on much lower wage rates, should prevail without regard to national needs.

The big issue, it seems to me, is not one of tariffs, high, medium, or low, but of what this country must do to insure its security and prosperity in a troubled world. Conceding that we have a stake in the prosperity of other nations, other nations have an even stronger need for our prosperity here. * * * We are a good customer only when our consumer purchasing power is high.

Nothing must be allowed to handicap or impede the development of those industries which are essential to the national security and the national defense.

It should be perfectly clear to everyone in Europe, as it should be to everyone here, that anything that weakens the United States threatens the security of all the free world.

It is an honor and a source of great pride that you have invited me to share this annual occasion with you.

We have been identified with the industrial citizenry of the State of Virginia since 1929 when we built a rayon plant here in Richmond. Since that time, in

addition to building the cellophane operations at the Richmond site, we have added an acetate plant at Waynesboro, a nylon plant at Martinsville, and an acid plant at James River. Over the years our investment in this State has multiplied from a relatively few million dollars to where the book value of manufacturing investment in the State of Virginia is $157 million at December 31, 1953.

Furthermore, Virginia ranks third in the amount of money invested by the du Pont Co. in the 26 States in which it has manufacturing facilities.

I have been outside the continental limits of the United States for some weeks. In fact, I think you might even say I have been out of this world because, for days on end, I saw no newspapers or magazines and didn't bother to tune the radio to news broadcasts. I returned, however, with what seemed to me to be an entirely fresh viewpoint. The perspective with which I look at things today seems a little different than it did a few weeks back, which is perhaps as good a reason as any to justify a periodic stay with the routine tasks.

After reading the papers and bringing myself up to date, I find myself looking closely at this great country of ours and the problems it faces in these eventful times. A number of matters appear to have developed rapidly during the time I was away. Perhaps the one that interests me greatly is the debate over the place of the United States in the world of nations and the extent to which American indusrial activity might be affected by national policy on matters of foreign trade.

Europeans look to United States

It is a critical and a crucial issue abroad as well as at home. In Europe, we find people looking hopefully toward this side of the Atlantic. There seems to be, on every side, a recognition of our country's vital part in preserving the peace of the world. There are, of course, some Europeans who think of our contribution in selfish terms, but the more responsible, on the other hand, know as well as we do how much depends on the United States maintaining its position of leadership.

Leadership, however, involves heavy responsibilities. It means to us too that we should analyze our situation carefully to see that our footing is certain and sound. Perhaps the need for critical self-examination is in itself one of the strongest responsibilities of leadership, for no one is ever so far ahead that he can take anything entirely for granted.

So, I have found myself asking time and again: "Why are we leaders?" What are the qualities that have given the United States its dominant place in the world of today?"

Freedom and personal initiative

Obviously, our position results most importantly from our industrial strength, from our capacity to produce. For the real answer, however, we must look deeper, for we have no monopoly on the means of production or on the inventive brains, the resourcefulness or other human attributes of a people. But what we do have is something of which we find very little in Europe today—a devotion and a dedication to individual opportunity as assured by our Constitution and as taken as a matter of national right by all Americans. Our more obvious signs of strength—our industrial potential, our advanced technology, our "wealth" as it is sometimes called, are all simply the fruits of the more basic and fundamental seeds—the seeds of human freedom and personal initiative.

So our place of leadership, so important to our own and to Western Europe's survival, depends upon keeping alive those qualities that are responsible for our strength. It should be perfectly clear to everyone in Europe, as it should be to everyone here, that anything that weakens the United States threatens the security of the free world.

So, the strength of the free world can be no greater than the strength of the United States. Keeping that strength at its maximum is a matter of vital necessity to everyone.

There was a time, I suppose, when international relationships could be left exclusively to the diplomats and to governmental authority. In the complex and tightly integrated world of today, however, it seems that there is no segment of society that it not, in some way or another, affected by world problems. This is certainly true of our business and industrial community, for some of the great public issues of the times revolve around the question of foreign competition in the American market. Here we have a problem which is a matter of personal concern, in one way or another, to everyone in business, whether as an employee, a stockholder, or a business manager.

Popular but not clear

A great debate is being waged on the whole question of our commercial relationships with our allies in Europe and with the rest of the world. The argument is advanced that the economy can best be served by "trade, not aid" and that reducing our tariff barriers would accomplish this. This has a persuasive air, of course, for obviously trade is a desirable process and aid is not. The same might be said for other expressions that have become popular if not too clear. We hear in Europe a lot about the so-called dollar gap, which may or may not be a valid justification for a helping hand. I am sure there are many of us here today who have experienced a dollar gap in our own personal lives from time to time.

I have no intention, however, of debating the specific issues of this tariff controversy. It is a difficult subject at best, and I have little inclination to add to the confusion. The trouble with the tariff question, it seems to me, is largely one of optics. We all see it differently, depending on the location of our seat and the condition of our eyes. The nearsighted tend to see it in terms of narrow self-interest; the farsighted tend to miss the fine print in front of their eyes in favor of the long view up the valley.

What we need actually is to look at this scene through the finest quality of bifocal lenses which will permit us to examine both world needs and the immediate requirements at home. There is little that can be gained by taking an extreme position on either side. Extremities simply muddy up the waters in between, making it difficult to resolve or even to identify the area of dispute.

Other nations need prosperity in United States

The big issue, it seems to me, is not one of tariffs, high, medium, or low, but of what this country must do to insure its security and prosperity in a troubled world. Conceding that we have a stake in the prosperity of other nations, other nations have an even stronger need for our prosperity here. Our position in the present military situation is obvious, and we can fulfill our responsibilities only when we are economically strong. Commercially, it must be remembered our purchases of European commodities rise and fall with our domestic economy. We are a good customer only when our consumer purchasing power is high.

Unfortunately, this essential fact has been largely overlooked in the black-and-white type of tariff discussion. I think it is an unfortunate omission, for its importance should be clear. In 1760, David Hume, the economist, said: "I pray for flourishing commerce in Germany, Italy, France, and all of Europe." I think today that everyone in "Germany, Italy, France, and all of Europe" might well have prayers for flourishing commerce in the United States, for in its absence, their own difficulties would be increased greatly.

Policy must aid defense

But the more significant fact that must be borne in mind in consideration of the tariff question is the question of security. Much of the discussion of trade between nations seems to presume that no aggressor will ever again arise to break the peace of the world. This assumption is comforting, but hardly realistic, because unfortunately, aggressors do appear, and we must stand ready to defend ourselves. And, if we are to defend ourselves, we must keep our arsenal intact. Therefore, whatever is decided about tariff policy must include provision for the security of the Nation—industrial and military.

It seems to me that the history of this city provides a grim, but telling, example of what happens when a nation at war is cut off from the sources of essential materials and has little capacity of its own to fill the gap. The Confederate States in 1860 had as unbalanced an economy as existed anywhere in the world, exchanging its agricultural products for goods manufactured elsewhere. The South's traditional devotion to free trade had been emphasized in the Confederate Constitution, but there was a large body of feeling that retarding the development of industry would be disastrous. The events of the war proved that those who had advocated a domestic industry were right.

Theoretically, it had seemed like good economics to exchange cotton and tobacco for manufactured goods from abroad. Actually, dependence on foreign soures applied a tighter squeeze than any which southern troops ever encountered in the field. And, as always, it was the strategic materials that proved most scarce. After the blockade became effective, for example, history shows that quinine which cost less than $3 an ounce in the Bahamas cost $1,200 an ounce in Richmond and was hard to get at any price. Shoes, blankets, and ordnance were

always in short supply and could be obtained only at a heavy drain upon the treasury. Essential civilian articles were even more difficult and higher priced. A bag of refined salt that cost $1 in 1860 brought $115 in 1865. Nails increased 9,000 percent in price over the same period; hides and leather goods 5,000 percent, and candles 50 times.

Tariff kept production alive

Would any of us like to contemplate, today, a situation in which virtually all of the drugs and medicinals like aspirin, Novocain, the sulfas and other vital articles would have to come in from overseas to meet both peacetime and wartime emergencies. The fact is that, as late as 1915, that was the case, for Germany was the principal source of these as well as many other organic chemicals up until the time of World War I. There was virtually no manufacturing capacity and little technical experience available in the entire United States. It was not until necessity led this country toward establishment of its own organic chemicals industry in 1916 that we even began to be self-sufficient in drugs, dyes, rubber chemicals, and other needs. After World War I, when this new American industry was just getting on its feet, German manufacture resumed. The German producers could produce at lower cost, to be sure, for their wage structure even then was far lower than ours. The American manufacturers were able to keep going only because President Wilson and the Congress believed their survival to be in the national interest. It granted enough tariff protection to keep the foreign makers from underselling American firms and putting them out of the business.

Production for the free world

Let's suppose that this country had taken the position then that, if the Germans could make organic chemicals cheaper than we could, they should get the preference. The American sources would have withered away. World War II would have caught us without the plants, the facilities, or the technical know-how to produce our own medicinals, dyes, or other organic materials, including such vital military items as picric acid or toluol. Without the nucleus of this technology and trained personnel, we would have lagged far behind in other fields as well. We would have lost the war before it started.

Fortunately, it didn't happen that way. By the time World War II came along, we had a chemical industry second to none. We were able to produce enough for ourselves and for the rest of the free world, for the research programs instituted by the industry had proved highly successful. When rubber supplies were shut off, we were ready to go with a synthetic that made us independent of the Malayan plantations taken over by the Japanese. When silk for parachutes was shut off, we were ready with nylon. Let me give you just 1 or 2 specific example: In World War I, to get enough toluol for explosives, we had to salvage the drip oils of the gas companies to eke out the meager supply—and the cost was $5 to $6 a gallon. In World War II, we had our own supply and we paid about 30 cents. Or I might mention methanol which is used in making powder as well as it is in antifreeze and any number of chemical processes. Up to 1925, methanol was made only from the distillation of wood, and this country's entire output was 7 million gallons or so a year. Today, even on peacetime schedules, we use over 150 million gallons a year.

Essential element of security

I cite these instances to show that we have created an industry in this country that is a most essential element in the national security. And I doubt if we would have it today if, in the early twenties, we had succumbed to the theory that a slightly lower price, based on much lower wage rates, should prevail without regard to national needs.

Everyone knows that modern warfare is as dependent upon technology as it is upon human performance, and that a corps of scientifically trained people is as vital as a corps of artillery or an Air Force wing. What is not so obvious, perhaps, is that both technology and technical manpower are dependent upon industrial opportunities. This is particularly true of the chemical field. In the days before World War I, when we made few of our own chemicals, American chemists were relatively rare, and chemists with advanced degrees were scarcer than winning baseball pitchers. Germany led the world in scientific education and research, and, if you wanted to study advanced chemistry or medicine, you went to Vienna or Berlin. In 1919, there were only 54 doctor's degrees in chemistry awarded by American universities. Today, thanks to a flourishing industry, this has increased to better than 600 a year.

Yet even this is not enough, for we must keep ahead of technological developments in other parts of the world. Other countries, too, are devoting much attention to their manpower resources. From all accounts, the Soviet Union is conducting a large-scale program in the physical sciences and engineering, and some observers believe that the number of graduates in Russian technical schools is greater than our own.

Incentive for our young men

Just what methods the Soviets use to fill their requirements in this field I don't know. Under our own system, in the simplest of terms, we can do it only by offering our young men opportunities for profitable employment. Only an expanding, flourishing industry, with the prospects of stable jobs and steady advancement, can provide the incentive, for we are not dealing with statistics here, but with the futures of our own children. We need only to look at Great Britain's shackled economy to see how closely technical manpower is linked with industrial expansion. Britain is producing only a third the number of engineers, in proportion to population, as is the United States.

American industry today is the principal reservoir of this indispensable pool of talent. In production technology, as distinct from the purely scientific, it stands alone. In the field of research, there are, of course, many very able people in the universities who form the hard core of scientific thought. Important research is also being done by or financed by various Government bodies. But the American industrial establishment has become so research conscious in recent years that it is now the largest employer of scientific personnel. The professional research staffs of private industrial laboratories now number over 70,000, and it is estimated will exceed 135,000 in 1956. The research budget of American industry now approaches $1 billion a year. It is here that our technology develops and our scientists find their chance to meet new challenges. It should be obvious that this vital element in our national strength would be seriously injured by anything which diminishes our own industrial opportunities.

Nothing must handicap defense

The tariff controversy is, as I have said, a complicated subject with considerable ground for debate as to both principles and terms. But one point is simple and clear: Nothing must be allowed to handicap or impede the development of those industries which are essential to the national security and the national defense.

No American manufacturer can contend that the tariff should be employed to protect inefficiency or disproportionate prices. It is only on those products where wage rates are a major factor in the cost or where the material has a strategic importance that some degree of protection is necessary. To imperil our position through the plea of lower costs of the foreign producer is a folly with the threat of a tragic aftermath.

If we follow the lure of cheap wages to its most ridiculous lengths, we should by all means buy our heavy armament, our ammunition, and even our atomic weapons from the Russians whose prices, if they should reflect the wages paid their workers, are surely the lowest we could find.

National security must not be auctioned to the lowest bidder. There are no bargains in the safeguarding of our freedom. I have no quarrel with the objective of helping our allies in any way consistent with our own interests. It is a reasonable, a humanitarian, and a businesslike purpose. But to deplete our own resources and weaken our own defenses is no answer, either to our allies or ourselves. I am confident that our people will not let this happen.

Our industrial strength must be sufficiently robust to meet the challenge of any enemy. Unless it is, we may reach that sorry day when there are no ramparts left to watch and none of us on hand to watch them. I am a poor hand at slogans, but, if we are going to have one, I would like to have something else to put alongside of "Trade—Not Aid." Perhaps "Liberty—Not Slavery," or "Hope—Not Despair," or, most of all, "Life—Not Death."

Mr. du Pont says roughly that the only way to maintain a chemical industry in this country is the way we built it up in the first place and that is through protection. The Montsanto Chemical Co. told this committee and I think others that our chemical industry is going back on the Rhine where it started from unless something is done shortly.

Do you think men like Mr. Queeny, chairman of Monsanto Chemical Co., and Mr. du Pont, vice president of the du Pont Co., might know what they are talking about?

Mr. PALEY. I would, sir.

Senator MALONE. That is what they said. I am saying the testimony of several dozen witnesses, we have had here, shows that obtains in many other industries. So it seems to me if that is true, it does not support your statement of expanding trade here under a free-trade system.

It looks more like a conspiracy to get wages down here. Some people reason that they can go across behind the low-wage curtain and ship the stuff in here and have a bargaining setup.

Mr. PALEY. I can assure you, when I advocate freer trade, I am not thinking in terms of any conspiray that might be put together for the purpose of lowering wages here or lowering our standards of living.

As a matter of fact, I have exactly the opposite result in mind.

Senator MALONE. I am sure you do, but I think what you have done has the effect nevertheless.

Here I have this and I will read it:

Henry B. du Pont—

I do not know Mr. du Pont—

vice president du Pont Co., said here today that whatever course the United States chooses in its tariff policy it must not overlook the vital factor of national security.

"National security must not be auctioned to the lowest bidder," he said in addressing the annual meeting of the Virginia State Chamber of Commerce. "There are no bargains in the safeguarding of our freedom. The big issue it seems to me is not one of tariffs—high, medium, or low—but what this country must do to insure its security and prosperity in a troubled world."

Du Pont warned against letting the plea of lower costs of the foreign producer—

which is what you have just testified to—

imperil our national security. He mentioned the organic chemical industry and recalls as late as 1915 Germany was the source of all organic chemicals used in this country. He said it was not until du Pont led the United States to establish its own organic chemical industry in 1916 that we began to be self-sufficient in drugs, dyes, rubber, chemicals, and other needs.

"When German producers, with their low-wage structure, resumed manufacture after World War I," du Pont said, "American manufacturers were able to keep going only because Congress gave them tariff protection. Let's suppose," he said, "that this country had taken the position then that if the Germans could make organic chemicals cheaper than we could, they should get the preference. World War II would have caught us without the plants, facilities, or technical know-how to produce our own medicinals, dyes, or other organic materials and we would have lost the war before it started."

As I get your proposal, we should do away with the tariff but give Du Pont and Monsanto and others some kind of a long-range contract on each one of these materials that you are going to need when war comes; right?

Mr. PALEY. I am not sure what the arrangements should be.

Senator MALONE. You would have to make some arrangements?

Mr. PALEY. I have said today I would make clear exceptions.

Senator MALONE. Would you make the chemical industry an exception?

Mr. PALEY. If it is clear a going chemical industry in this country is necessary and vital to take care of our needs during a wartime

period, I would certainly make such arrangements as would seem fair and effective.

Senator MALONE. Do you think that a tariff arrangement is fair and effective if it kept us in the chemical business?

Mr. PALEY. I would prefer other arrangements of a more direct nature.

Senator MALONE. Do you have any suggestions?

Mr. PALEY. There might be long-term contracts made with each.

Senator MALONE. With the Du Pont Co. and Monsanto and maybe 100 other chemical companies there would be a contract on each chemical product.

Mr. PALEY. For whatever chemicals we thought might be in short supply I think we could make individual arrangements, or general arrangements under which all manufacturers of chemicals would know they could sell at a certain price.

As a matter of fact, I think that system is being used now in connection with manganese and two other materials.

Senator MALONE. Manganese, tungsten, and a couple of others. It is my bill, for manganese and tungsten.

Mr. PALEY. Yes; and chrome.

Senator MALONE. It is my bill and it would not be necessary at all if you had any protection. Such a thing should not have to be passed by Congress or extended every 2 years or every 3 years. It is not a proper way to spend the taxpayer's money and it does not stimulate private investment.

We are now getting complaints from all over the country, shall we put in a mill? Shall we expand production? Shall we try to keep going? What are you going to do when 1958 comes around? That is when my bill extended it to, that date. So it is not satisfactory for any private investor.

The only thing you can do is take taxpayer's money and keep throwing it into the deal. What I am trying to find out is what you think you are trading these industries for. You are not trading them for the chemical industry, not trading them for the machine-tool industry, not for the watch industry. All those things are moving out.

Whatever make watch you have on your wrist the works are now made by one company.

They are made in Switzerland because you can get them $2 or $3 cheaper. So what we are trying to find out so we can make definite recommendations to the Senate is what will get this money back into the investment field. It certainly will not be done by having Congress pass a law every 2 years. They simply will not spend it because even miners and chemical people get smart after a while.

Mr. PALEY. I agree with you that the sooner we can come to long-range policies that we can depend upon, and our allies can depend upon, the better off we will be.

REDUCTION OF TARIFFS AT THE EXPENSE OF DOMESTIC INDUSTRY

Senator MALONE. I want you to know that this is a very informal hearing, and that your testimony will be sent to you for completeness and correction. Would you agree with me that if you gave them an equal access to our market, and they could always depend on an equal

access to the market, that would be enough to bring about this world expansion that you talk about?

Mr. PALEY. I don't think so, if by equal access you mean a tariff arrangement. The net result would be that we would be using materials that would be costing us more money.

Senator MALONE. Then you would need to pay for them. I get your theory right down to the ground. You think you should get zinc, crockery, textiles, machine tools of the quality you want where you can get them the cheapest, and not have any tariff to hamper you?

Mr. PALEY. I say I would have this change come about in a gradual way.

Senator MALONE. So they would have time to move away.

Mr. PALEY. Gradual change is certainly preferable to a drastic change.

Senator MALONE. You do not see this picture as I do. For 175 years, in fact, until our policy was changed in 1934, if you started a business in the United States you only had to meet the competition of those paying the same wages and taxes as you did. Now, I take it, you want to continue the policy we have followed since 1934 and do away with any equalization so that you will have to compete with any wage level which may exist anywhere in the world.

Mr. PALEY. Depending of course on those countries making the same adjustments insofar as their trade practices are concerned.

Senator MALONE. Of course, you know they have made no adjustment. If you do not know it, I want you to read this report when it is printed. It will not be very hard to read. It is plain that whenever you made one of these agreements not a nation yet has kept the agreement. What they do is manipulate their currency and establish a quota system and use exchange permits and trade permits, and maybe 15 or 20 other restrictive methods that international traders have used for 100 years, to prevent the very thing you think you are getting.

Mr. PALEY. If that is happening, sir, I think we ought to be tougher.

Senator MALONE. You cannot be tougher if you make a trade agreement for 3 years.

Mr. PALEY. If one side is not living up to the agreement you can get tougher. In other words, I think we could demand——

Senator MALONE. You would have to cancel every trade agreement you made to date and start over.

Mr. PALEY. I am not acquainted with the facts. I take it for granted, if we make an agreement with a country on the basis of tariffs and trade or anything else, that we can expect that country to live up to the terms of that agreement.

Senator MALONE. And you did not know that they were not living up to them?

Mr. PALEY. I have no specific examples in my mind now.

Senator MALONE. I will give you one and furnish the documentary evidence if you want it. I made a little talk on the Senate floor about it. Two of our copper companies operate in Chile. Chile had seven different prices on its peso. One of them was the price at which the copper companies bought pesos to pay their men, they received 19.37 pesos for a dollar. They paid their wages on that basis. Then when a wage earner took his pesos in the market, his purchasing power was on the basis of 140 to 160 pesos to the dollar. Then on certain purchases from this country, there were intermediate rates. So there was no chance to win.

Now we have made a study, not that detailed, on nearly every nation where we have trade agreements. I can say to you for your information, and I hope you study it, that is the situation in nearly every case.

The nations of Europe do not trade with each other. They have tariff barriers between each other. It is hard to sell an Italian orange in Belgium, or in England, or Belgium steel in Italy. It is not hard for us to give it to them, but it is pretty hard to sell it to them. They are smart international traders; we are not. We are the most stupid people on earth.

Now, you have what they call a peril point in the Trade Agreements Act. That sounded good to the people and it sold them for another couple of years on the program. What is that peril point? The Tariff Commission determines a peril point; that at a certain point without tariff protection that industry would be imperiled, and that is where the tariff ought to be. They recommend it to the State Department, which may or may not take it. They never have to my knowledge. But if they did take it and used it in a 3-year trade agreement it would be in full force and effect until we canceled it with a 6 months' notice. Yet 10 minutes after the ink is dry, they can change their currency price and destroy the effectiveness of the agreement. Or they can have a quota system and will not let imports in at all. We have nothing in our trade agreement that would let us compensate for such actions. But the Tariff Commission if we leave it in their hands on the basis of fair and reasonable competition, can compensate for it. That is what I am trying to say. We are all searching for the best method to do it.

Mr. PALEY. Yes.

FOREIGN ECONOMIC POLICY RESHAPING NECESSARY

Senator MALONE. What I would say to you, you have to have something that is done by Congress by law, and not by a State Department official who may or may not be there 60 days from the time he makes the agreement, and is not accountable to anybody. He does not have to go home and account to the people that are in the industry at all. He can treat the United States like one big business, like you have done today. What such an individual thinks will increase the business of the country or be to the interests of the country in his judgment—not in a collective judgment of the country—can determine the basis of an agreement. Is that not what can be done under the present law?

Mr. PALEY. This whole basic question, Senator, is coming up for consideration.

Senator MALONE. That is just what we are doing.

Mr. PALEY. It is up to the Congress in all of its wisdom to come up with the right answer——

Senator MALONE. There is one thing I would like to say to you.

Mr. PALEY. Or the best answer.

Senator MALONE. The greatest disservice ever perpetrated on this country has been the fostering of the assumptions by Commissions such as yours that there is one best answer to all economic questions. That just is not so.

Mr. PALEY. Not a final answer. The best answer one can find at any given moment.

Senator MALONE. The best answer one can find is to let everybody compete on an even basis. This is the thing we have had for 175 years. But when you put a personal factor in it so that you, if you are temporarily the Secretary of State; the present Secretary of State does not pretend to know anything about industry, and does not; can trade an industry down the river that you have never seen because you think, and your advisers think, that it would increase the trade of the country, you are destroying the United States of America as we have known it for 175 years. This leaves it in the hands of one man interested in one world economics.

There is no one answer to these questions. We all come up and go broke and come up again. Even in the engineering business, that is true. Somebody asked me how I am getting along here, and I said there were years in the engineering business that I did not make any money, but this is the first time I have been in a place I did not have a chance to make any money. So everybody is looking for a sure thing, and comes to the Government to get it. The only sure thing is taxes you get out of a man who is working with his hands down in the country someplace.

Mr. PALEY. On this particular question, I am sure Congress is not looking for a sure thing. It is looking for a decision on this basic question which, as you point out, will have a very important influence on our economy, and the economy of the entire world.

Senator MALONE. Now, Mr. Mason, you are an economist. As an engineer I have the highest regard for an economist.

Mr. MASON. Thank you, sir.

EXPLANATION OF PROJECTIONS OF RATES OF CONSUMPTION MADE BY PALEY COMMISSION

Senator MALONE. You understand how these reports are made, and the statistical procedures used. Your charts on page 9, volume 1, project the increase in demand for materials over the 1950 consumption base. I notice you come up with a rather exact figure. They show, for example, that the demand for aluminum will increase 291 percent in the United States. The demand will increase 415 percent in the rest of the free world.

Would you be willing to support these figures and could you tell us why the aluminum demand would not be 275 or 250 or 260 percent rather than 291 percent. How did you arrive at the figures?

Mr. MASON. Yes; I will be glad to talk to that.

Let me start out by saying that these are not predictions as I explained before. They are projections of the rates of consumption that would be arrived at in 1975, if the assumptions on which these estimates are based continue to be accurate. In making these projections, there are about five steps. The first step is to get an estimate of population. That estimate we got from the Bureau of the Census. We took their median census estimate and 193 million was the figure. As I pointed out this morning, I think that is too low. The population is likely to be higher.

Senator MALONE. Do you think your projections will have to be reexamined again in about 10 years?

Mr. MASON. Yes; I think projections of any sort have to be changed.

Senator MALONE. Why do you think they would benefit the country

knowing that there never had been an accurate projection when you made these projections?

Mr. MASON. I would say that we had about 150 years of experience of continuous growth in the United States during which the national income had doubled approximately every 25 years; it seemed to us that it was likely to double in the next 25 years. If that is so, what is this increase likely to result in with respect to materials requirements? You asked me, Senator, to go through the steps. I would be glad to do that if you want me to do so.

Senator MALONE. All right.

Mr. MASON. The first step is the estimate of population growth. The second step is securing from that estimate an estimate of what the labor force in the United States is likely to be. If you have this population estimate, you get an estimate in terms of age groups, and you can make an estimate of what the size of the labor force is.

The third step is to apply to this labor force some assumed rate of increase in productivity. Over the last 50 years, the general trend in per capita productivity in this country has been slightly over 2 percent per annum. The figure that was used in this estimate is an increase of 2½ percent per annum. If you have these estimates, then, of per capita productivity, and the size of the labor force, that gives you a projection of what national income is likely to be. The projection of national income arrived at here was roughly a doubling of national income by 1975. If you have a national income of that sort, then what might one expect, roughly, with respect to requirements and consumption of broad groups of end products, investment goods, durable consumer goods, and so on.

You try to get an estimate of these broad groups of end products that is consistent with a doubling of the national income. From those estimates of end products you acquire some notion of what your materials requirements are likely to be.

There is one further assumption made in these projections and that is that the price relationship as between these materials do not substantially change over the next quarter of a century. In some respects they are certainly going to change. So that this projection is only as good as the assumptions on which it was based.

Let me say, Senator, that as far as I can see, the greatest reason for thinking that materials requirements are going to increase very largely is that for 150 years, quarter century by quarter century, they have increased very largely,

Senator MALONE. Let us suppose your assumptions are correct; what result are you trying to arrive at?

Mr. MASON. The result you are trying to arrive at is some kind of an estimate of how much materials we are going to have in the United States in order to meet these requirements.

Senator MALONE. Then, are you assuming that we cannot increase our production here if it is put on a profitable basis with an incentive for private capital, or are you assuming you have got to get this added material someplace else, or what is your objective?

Mr. MASON. As Mr. Paley explained this morning, to meet these requirements one is going to have to depend on greatly increased domestic production. You are probably going to have to depend on increased imports, and you are probably going to have to depend on

technological changes that permit you to substitute more plentiful materials for scarce materials.

Senator MALONE. Did you in your study find any area any time in history where you had any trouble in getting the imports when you needed them?

Mr. MASON. No. I do not think that is true except in wartime, of course.

Senator MALONE. What is your objective? To build up a case to justify additional imports?

PALEY COMMISSION OBJECTIVES

Mr. MASON. No; the whole purpose of the thing was to answer the question how are these requirements likely to be met without substantial increase in cost per unit.

Senator MALONE. How do you expect to secure these materials without any substantial cost increase when wages double and treble and all costs are doubled and trebled?

Mr. MASON. One reason is that wage costs have been doubled and trebled throughout our history and material prices have gone down.

Senator MALONE. Not all of them, I am sorry to say. Many of them have. As a matter of fact, that is due, is it not, to the inventions and improved machinery and laboratory experiments and better separation of minerals and all that sort of thing?

Mr. MASON. It is due very largely to technological improvement.

Senator MALONE. That is right. Do you not think if a policy is laid down by Congress, not by some Cabinet official to encourage capital investment and expenditures through research that technological advances will be furthered and we will come closer to meeting our long-run materials problems?

Mr. MASON. You mean by domestic production alone?

Senator MALONE. No. Do you not think that we need incentives such as we had for 175 years to promote these technological inventions and advances?

Mr. MASON. I think they will have, and I think they have incentive now.

Senator MALONE. What is it?

Mr. MASON. I think tremendous technological improvements are going on now.

Senator MALONE. Would you give me some of the incentives they have now in the mining business, for example?

Mr. MASON. Presumably if they see a profitable opportunity which cannot be taken advantage of without some important technological change, they have an incentive to work at that.

Senator MALONE. Did you know that just one factor, the importation of a stockpile developed with our money was allowed in here without any evener at all, and not only put the boys out of business that were in it, the private investors, but on the basis of the present price they now have practically no reserves.

EFFECT OF IMPORTS ON DOMESTIC PRODUCTION

Mr. MASON. You mean these imports went into the stockpile?

Senator MALONE. They did not go into the stockpile. Some went into the stockpile, but most of it went into private industry and broke the market.

Mr. MASON. What commodity are you talking about?

Senator MALONE. Zinc and lead. I can mention others. They are the glaring ones. Mercury is another one; manipulation started immediately after the war as soon as you could get it again from Spain. Naturally they can produce it over there at $50 a flask and send it in here at their wages. If we had had any kind of a tariff duty that made up the difference in the wages and taxes, you would still be in the mercury business. Now you are not in it, and cannot get in it very soon. So I say to you what is the final objective? What were you trying to sell the country with this report?

Mr. MASON. We were trying to sell the country in general the things that ought to be paid attention to, and the considerations that are likely to promote the continued economic growth of the United States.

Senator MALONE. You just go ahead.

Mr. MASON. One of the important things that we had in mind was a continuation of the ability of this country to meet its materials requirements without large increases in cost or prices of these materials.

Senator MALONE. You mean to meet them by imports from foreign low-wage countries.

Mr. MASON. If they are cheapest there, taking full account of security problems; yes. If the cheapest way of doing is from domestic production——

Senator MALONE. Let us pause here. We need to clarify your opinion. Do you want to leave out this list that we are investigating here, the 77 critical minerals and materials? Do you want to leave them out?

Mr. MASON. Not at all.

STOCKPILING FOR NATIONAL DEFENSE

Senator MALONE. Then how do you think you are going to get your manganese delivered from India in case of all-out war?

Mr. MASON. You are not going to get your manganese from India, unless you take adequate precautions to create a substantial stockpile.

Senator MALONE. How much of a stockpile do you think you would need?

Mr. MASON. I do not know. I gather that the stockpile estimates are based on a 5-year war. Maybe that is wrong.

Senator MALONE. It is classified material, but it would probably cause you to have a stroke if you knew what it was.

Mr. MASON. Yes, sir. What I am trying to say, Senator, is that you meet that problem——

Senator MALONE. By stockpiling.

Mr. MASON. You meet that problem in the lowest cost way in which it can be met. If the lowest cost way is expansion of domestic industry, you meet it that way. That does not seem to me to be the way in the case of manganese to meet this problem. If the lowest cost way is by accumulating a stockpile plus expansion of the domestic industry, that is the way to meet it. Senator, may I interrupt you a minute? I have a short statement which at some stage I would like to introduce into the record. It is a 10-minute statement which I can either read or turn over to the committee.

Senator MALONE. Let us complete this one line of thought. I am sorry I did not ask you to read the statement to start with.

Mr. MASON. I think the statement answers some questions you have in mind.

Senator MALONE. I want to get the Commission's thought straight as I understand it from Mr. Paley, and I think I understand it thoroughly and the record is clear. The Commission says that we should get the minerals and materials, whether it be zinc, lead, or textiles or machine tools or any other material from the area where you can get it the cheapest, without any regard to the difference in wages and taxes or standard of living or anything else. Is that true?

Mr. MASON. I would restate it only this way. What we should try to do is to put ourselves in a position to have ample supplies of materials for peace or for war at the lowest possible cost.

Senator MALONE. In other words, the only criteria, if you are talking about manganese or chemicals—we all know that chemicals can be manufactured in Germany just as good as our own at a fraction of the cost in many cases.

Mr. MASON. Yes, sir. I also know, Senator, that our exports of chemicals are far in excess of our imports of chemicals.

Senator MALONE. We will check that item. I am not in a position at the moment to argue with you about that. But assume it is true. How long do you think it will be true as Germany piles up her industry if you let them alone? You know we have restrictions on Germany's production now so that there are certain markets they cannot get into at all. You know that.

Mr. MASON. Yes.

Senator MALONE. Suppose they could get into all the markets of Europe and Asia without restriction, how long do you think we would export more than we manufacture?

Mr. MASON. I think quite a long time. After all, when you are talking about a chemical industry, you are talking about a wide variety of products.

Senator MALONE. I know that.

Mr. MASON. If you consider one of the most important products of the chemical industry, you are talking about sulfuric acid, we have by far the lowest cost supply in the world. I would expect that we would remain an exporter of sulfur for quite a while, and in the field of sulfuric acid, nobody is going to take that market away from us.

Senator MALONE. I expect you are about half right on that and that there will be exceptions. That is one out of a thousand chemical products. Name some more.

Mr. MASON. The only point, Senator, is that in order to form a judgment, you would have to go into a whole list of chemical products.

Senator MALONE. We have already.

Mr. MASON. Perhaps you have assured yourself of what the situation is.

Senator MALONE. We have assured ourselves of this situation. We must study it further, of course. There is practically nothing being manufactured today that you cannot produce in a plant with the same know-how and the same machinery, with the same superintendents and the same foremen, in some low-wage country, and beat the ears off of labor and small business in this country.

Mr. MASON. I want to make one more general statement there. To the extent that we import products, presumably the foreign countries

are receiving dollars from us for those products. To the extent that they acquire dollars, they are going to want to use them. If they use those dollars that means they are going to spend them in the United States for our exports. So if is true that in certain areas, and I have no doubt it is true, that our imports will increase, that means that foreign countries will earn more dollars and that means they will spend more dollars in the United States.

Senator MALONE. There is one thing that would bear study. You are a great theorist. I can tell that by reading your report. You get credit for writing most of it.

Mr. MASON. It is undeserved credit.

Senator MALONE. I am not so sure it is. No individual or nation ever buys anything that they can conveniently produce for themselves. When they cannot conveniently produce it for themselves, they buy the quantity that they want where they can get it the cheapest. Would you say that is a very good statement on the theory of trade?

Mr. MASON. Yes, as long as there are no substantial barriers to trade. They will try to buy in the cheapest market and sell in the dearest market.

Senator MALONE. I am talking about the conditions laid down in each country. The conditions now as you know are that the tariffs are higher in the European countries than they have ever been.

Mr. MASON. That is right.

Senator MALONE. And ours are lower than they have ever been.

Mr. MASON. Excuse me. I take it when you are talking about tariffs, you really mean the whole question of trade barriers. The barriers to trade imposed by foreign countries.

Senator MALONE. It is practically impossible to trade with them. Still we go through this farce of making trade agreements. It is a one-way street. All you have to do is to go into it yourself if you have any doubt about it. Let us suppose, though, that it was a two-way street, but they have the cheap labor, they have the low operating costs. You know the New England States got a little aggravated with the South because there was cheaper labor and the industry moved out and now they are moving to a foreign country because there is no protection. Do you think it would be any different in the case of textiles moving from New England and going to the South because temporarily the wages were lower than going to some foreign country?

Mr. MASON. Not at all. I think if production is cheaper abroad then probably goods for which it is cheaper will be sold in this country. That means those countries will acquire dollars in exchange for it, and it means they will use those dollars in buying other goods from this country.

Senator MALONE. That means in your judgment that in a one-world economy there would be no barriers of any kind and no differentials of cost and therefore there will be an average standard of living in due course of time.

Mr. MASON. No; I do not think that will be so at all.

Senator MALONE. What will prevent it?

Mr. MASON. I think we will maintain our higher standard of living whether we have a low protective tariff or whether we do not have a low protective tariff.

Senator MALONE. What good does a low protective tariff do?

Mr. MASON. What good does it do?

Senator MALONE. Yes.

Mr. MASON. The good it does is presumably to permit us to meet our requirements from the lowest cost sources of supply.

Senator MALONE. What I really meant, what good does it do the producer here if the tariff is lower than the differential of cost? Does it do him any good?

Mr. MASON. In some cases you have no tariff at all, and this country is nevertheless an exporter. If you want to take one particular example, take the coal industry. In the coal industry our wage rates are at least three times as high as what they are in Western Europe, and maybe more. That has not prevented us from producing coal more cheaply than Western Europe has produced it, and we have exported coal on quite a large scale to Western Europe since the war.

Senator MALONE. We paid for it with Marshall plan money, did we not?

Mr. MASON. The Marshall plan countries could use their dollars to buy the goods they wanted.

Senator MALONE. That is right. Anyplace they want to and they do. They all do not come back here.

Mr. MASON. Eventually they do come back.

Senator MALONE. You will have to explain that to me.

INTERNATIONAL GOLD PICTURE

Mr. MASON. I would explain it to you in this way. If Britain, France, or any other country gets dollars and decides to use those dollars not in the United States but buys products from Brazil, let us say, then Brazil has the dollars and Brazil is going to use the dollars presumably for something. Those dollars are not going to sit idle. Presumably they are going to be used to purchase goods from the United States.

Senator MALONE. Do you know they have used those dollars to buy gold out of the vault? Do you have any knowledge of that at all?

Mr. MASON. You mean out of Fort Knox?

Senator MALONE. Yes.

Mr. MASON. No; I do not know what the situation is.

Senator MALONE. I will tell you they have. If you think that it is a good thing to keep giving them dollars and have them buy gold out of Fort Knox so they can buy anyplace in the world, I think you are on pretty dangerous ground.

Mr. MASON. All I know is that the gold reserve of the other countries of the world have incerased over the years.

Senator MALONE. And ours have decreased.

Mr. MASON. Yes. Where they got the gold, I am not informed. My guess would be that they got it out of current production in South Africa.

Senator MALONE. That is a pretty good guess. We buy it at $35 an ounce, and they buy it with the dollars we give them. It is a great system. Go ahead and read your statement. We can start again on the cross examination.

Mr. MASON. You want me to identify myself at all?

Senator MALONE. Yes, for the record.

Mr. MASON. My name is Edward S. Mason. I am dean of the School of Public Administration at Harvard University. My knowledge of

the mining industry, my experience in the industry has been at an extremely low level. I was for a few months a mucker in the East Pittsmont Mining Co.'s mines in Butte, Mont., and I was for a few months a mucker in the Eagle Pitcher Lead Co. mines at Oklahoma. I hope you will inform these people that a mucker in the mining industry does not mean the same thing as a mucker outside of the mining industry.

Senator MALONE. If they do not understand what that means they are on dangerous ground in theoretically trying to run the mining industry.

Mr. MASON. But at least I have seen the interior of mines.

Senator MALONE. In that connection, do you know on what basis they work and talk when they are trying to promote a mine and trying to get money to finance it?

Mr. MASON. No, as I say, my direct experience with the mining industry has been at an extremely low level.

Senator MALONE. I will tell you for your information. I started with one of those short-handled shovels, too. But you cannot finance a mine on anything unless there is some kind of a long-range protection set down through a law by Congress, not by some public official that may or may not be there tomorrow, and could get up with indigestion some morning and break everybody in the business by another trade. That may be a little beyond that short-handled shovel.

Mr. MASON. I am sure it is. I would take it, though, that is the situation in most industries.

Senator MALONE. That is the situation in most industries. It is the situation in Washington today. There are some men that can break anybody in any business at the moment. Right at the moment, if you care to, you might want to take issue with me. If you did I would put your stuff in the record.

Last Wednesday, a week ago, I made a little talk about our depressed areas and the imports going into these depressed areas. I would be very happy if you would take a look at it.

Mr. MASON. I will be very pleased to. Shall I read this statement now?

Senator MALONE. Yes.

RECOMMENDATIONS OF PALEY COMMISSION ON FOREIGN MATERIALS POLICY

Mr. MASON. This statement is a brief discussion of the recommendations in the foreign resources sections of the report of the President's Materials Policy Commission.

A central objective that influenced the recommendations of the President's Materials Policy Commission might be stated as adequate availability at minimum cost. Adequate means ample supplies to meet the materials requirements both of peace and of war. The minimum cost standard means lowest cost when account is taken of all alternative possibilities including the possibility that certain sources may be shut off in event of war. It furthermore means procurement from sources where costs are expected to continue low; it does not necessarily mean procurement to take advantage of every market opportunity.

The growth of the United States has depended upon the availability of materials from low-cost sources of supply and the continued growth

of this country is dependent on the maintenance of this situation. If we are forced to procure materials from higher and higher cost sources, the growth on which both our security and prosperity depends will inevitably be checked. Procurement from higher cost rather than lower cost sources means essentially the diversion of manpower and capital away from efficient and toward inefficient employment.

Senator MALONE. At that point I would like to ask you if you take into account the inflation? In other words, if it cost 20 years ago a certain amount per unit, and it is no more now than the inflation of the currency, would you say that is an added cost?

Mr. MASON. No; I would not. I would talk about the cost in constant dollars.

Senator MALONE. Then it ought to interest you to know that many of these costs barely have kept pace with the inflation which has caused the additional wages.

Mr. MASON. I am aware of that fact, Senator. I think it is a matter of great importance.

Senator MALONE. But that does not interfere with the fact that you could then 20 years ago and can now get it from a low cost labor area much cheaper. You want to get it as I understand it where you can get it the cheapest regardless.

Mr. MASON. Taking into account the need for ample supplies in peace and war.

Senator MALONE. When you say in peace and war, you know you can get it in time of peace, so you could possibly leave that out.

Mr. MASON. This statement I think is going to answer many of your questions.

Senator MALONE. I would like to clarify that particular thing. If you say in peace and war, you naturally can get it in peace, you can also get it in time of war unless that nation is an unfriendly nation, unless it is a nation like India which stopped the shipment of monazite sands in time of peace.

Mr. MASON. If you cannot protect yourself from that, you should not import from that area.

Senator MALONE. The situation we have ourselves in now is a result of the policies that were laid down in 1934 through the Trade Agreements Act. Both of you are advocating the continuation of these policies, is that right? In these countries where you are dependent at the moment for your civilian supply, you are subject to a mild form of blackmail. It is not so mild.

Mr. MASON. In case of blackmailing countries, what we have to do is to be just as tough as they are.

Senator MALONE. What do you call South Africa which is controlled by Britain when we make contracts there at a greater price for these strategic minerals than we pay our domestic producers? We pay Chile more money for copper than we pay our domestic producers?

Mr. MASON. Senator, the Commission report had nothing to do with this particular issue.

Senator MALONE. But it lays the groundwork for it.

Mr. MASON. I do not think it does.

Senator MALONE. You say you should get it wherever you can get it cheapest. You get it the cheapest when you are good to them. Let me tell you what I was told in a coal area in Birmingham, England. I went down to get into the coal mines and the steel mills. Sir Neville

Smith was in charge of the coal areas. I was just listening. The first thing he said to me, he said, "You know what you ought to do in America." This was in 1947, when we were getting ready to consider the Marshall plan. "You ought to continue lend-lease without any thought of getting repaid." I did not say anything. I was a freshman in the Senate. I had never met him before. He watched me for a minute, and he said, "You know, we control three-fourths of the raw materials of the world, and if necessary we can prevent their export." I still did not say anything, but I thought that was quite a silent threat; yet that is what they are doing to force us into further agreements.

Somebody said on the ticker, according to a note which was sent in to me, that we are dependent on the Malayan States for tin and rubber; therefore we must move into Indochina. Maybe we must move into Indochina, but not for that reason.

Mr. MASON. I agree with you 100 percent.

Senator MALONE. I will argue that other question with some people before we get through.

Mr. MASON. Shall I continue?

During the course of the last half century the United States has shifted from a net export to a net import situation with respect to a large number of basic minerals including oil, iron ore, copper, lead, and zinc. If our economy grows in the future as it has in the past and our consumption of minerals grows commensurately we may expect to see an increasing dependence on foreign sources of supply. This dependence creates a security problem of serious dimensions but it is not an insoluble problem.

Senator MALONE. Why can we expect to be more dependent on foreign sources? Because of the policy you advocate.

Mr. MASON. If we continue to draw supplies from the lowest cost resources.

Senator MALONE. In other words, if we continue under your recommendation that we get it wherever we can get it the cheapest and the wages and operating expenses continue to be lower there, we will continue to be more dependent on the foreign sources.

Mr. MASON. That is right.

Senator MALONE. Go ahead.

Mr. MASON. Some foreign sources such as Canada and Mexico are as safe in the event of war as the United States. Others, though more remote, are within a zone that presumably can be defended. Still others, and these must be assumed to include most of the Eastern Hemisphere with the possible exception of Africa, will presumably be denied us in wartime.

The probability that a source of material supply will be closed to us in wartime does not necessarily mean that we should refuse to procure from that source in time of peace. There are ways of guarding against this eventuality, including stockpiling and the construction of standby capacity as in the synthetic rubber and oil. Whether we should seek materials security through stockpiling, the construction of standby capacity, or the maintenance of a going concern domestic mining industry, is largely a cost problem. Adequate materials availability in time of war is a necessity; how we should attain adequate availability is essentially a matter of costs. We should choose the course of action that gives us the most for our money. In calcu-

lations this kind of stockpiling has two tremendous advantages. It permits the procurement of adequate supplies at low peacetime prices rather than high wartime prices, and even more important, it lessens the diversion of scarce manpower in wartime materials production, if these materials are above ground and ready for use.

Senator MALONE. Could I ask you a question at that point, and I will try not to interrupt you. I want to get it very definitely in the record as to just what your attitude is on building up the economy here. Do you think the overall economy of the United States and the overall good to this Nation can be best served by getting every material of the grade we want from the lowest cost source in the world?

Mr. MASON. Assuming that we acquire adequate material supplies to take care of the war eventuality.

Senator MALONE. You are talking about national defense.

Mr. MASON. Yes.

Senator MALONE. Let us leave the national defense out just a minute. You believe if we are assured of our defense, then we should get every article of the quality we want where we can get it the cheapest?

Mr. MASON. Yes.

Senator MALONE. That would build our own economy?

Mr. MASON. Yes; if you ignore the military security item.

Senator MALONE. Yes. So as far as the national domestic economy is concerned, you think it is best served by getting it from the lowest cost operating nations with low-cost labor if the taxes and other factors combined make it the lowest-cost production?

Mr. MASON. Yes.

Senator MALONE. All right. Go ahead.

AMERICAN PRODUCTION OF FOREIGN MINERAL DEPOSITS

Mr. MASON. The bulk of our imports of minerals are produced by American enterprises abroad. United States private investments in foreign minerals production now totals some $6 billion of which something over two-thirds are oil investment. The President's Materials Policy Commission believed strongly that so far as possible materials development both at home and abroad should be undertaken by private capital. To this end a number of its recommendations were designed to facilitate United States foreign investment. Among these were recommendations for tax reduction on United States earnings abroad; an acceleration of the investment treaty program, and the negotiation of executive resource agreements with other governments designed to remove deterrents to minerals investments.

Senator MALONE. Right at that point, there was a proposition before the Ways and Means Committee in the House, and I understand that maybe favorable action will be taken on it to further lower the taxes on earnings abroad. We know from our investigation here that our producers in this country, let us say our uranium producers, are retarded through taxes. In other words, they have a 15 percent depletion allowance. Many of the larger producers out there, and maybe some of the smaller ones—we had 2 days of hearings in Salt Lake City—after a few months had to shut down because they are mining reserves, and they do not have money to develop new reserves under

the tax system. The more production, the less they can pay their investors. So they shut down for the year.

Many believe that with the same treatment given the producers in the Belgian Congo and other places that in 3 or 4 or 5 years uranium would be running out of our ears in this country.

You still believe that we should give better tax treatment to foreign producers than the domestic producer?

Mr. MASON. Obviously, Senator, we cannot do anything about the taxes that the foreign governments place upon their own operators. Our recommendations were limited to taxes on the earnings of United States enterprises operating abroad. My understanding is that the tax system treats those earnings in some respects worse than they treat the earnings of the domestic corporations operating at home. My understanding is that as far as earnings of United States corporations abroad, they have to pay the same corporation profits tax that our own domestic operators do, and they cannot take advantage of a number of possibilities that exist for domestic producers to write off losses, and so on.

Senator MALONE. But the tax load of our producers that locate abroad is much less than the same producer operating at home.

Mr. MASON. That is not my understanding of the situation.

Senator MALONE. We will let the record stand for that. But our testimony here is that if we gave the producers here the break they do in some other nations that there would be no question about the amount of uranium and also there would be no doubt about many other materials. We are getting the raw materials for titanium largely from Australia and India. There is probably more illmenite in the United States and southern Canada already proven to last this country 100 years. But we insist on getting it from foreign nations. Go ahead.

Mr. MASON. Senator, I would just like to say that the tax recommenadtions in this report insofar as they relate to the foreign field were based on the assumption that American corporations operating abroad were treated worse rather than better by the United States Government.

Senator MALONE. What were your recommendations in regard to that?

Mr. MASON. There are a whole series of detailed recommendations.

Senator MALONE. What do they add up to?

Mr. MASON. They add up to an attempt to secure treatment on United States investments abroad equal to the treatment of United States investments in this country. That was the general objective.

The Randall Commission report goes much further than that in recommending tax concessions on earnings abroad. I think they go too far.

Senator MALONE. What does it recommend?

Mr. MASON. It recommends very sizable reductions on earnings of United States corporations abroad.

Senator MALONE. In other words, give them an advantage if they will go abroad and invest their money.

Mr. MASON. Yes. Presumably they wanted to encourage United States foreign investment. May I proceed further?

Senator MALONE. Yes.

Mr. MASON. The Commission recognized, however, that in this troubled world private investors are not likely to be willing to undertake the full risk of expanding output necessary to our security when the demand may be transitory, when production locations may be vulnerable or when, as with tungsten, low-cost supplies from behind the Iron Curtain overhang the market. Consequently, and entirely on security grounds, the Commission favored an assumption of part or the whole of the risk by Government in such situations. This can be accomplished for both domestic and foreign output by long-term purchase contracts, the setting of price floors, Government provision of part of the investment or, in cases of extreme risk, the letting of management contracts for materials expansion.

Senator MALONE. You advocate in that regard just what they are doing through the GSA and other agencies of the Government, a guaranteed unit price under a contract.

Mr. MASON. That is one method of dealing with this problem.

Senator MALONE. But they would be guaranteed a profit.

Mr. MASON. I do not understand that to guarantee a profit. You can have a price floor, together with a long-term purchase contract whereby the Government undertakes to purchase all that is produced at a fixed price.

Senator MALONE. They would think it was at a profit or they would not take it.

Mr. MASON. I think the Government in that case assumes the major part of the risk, but I do not think that guarantees the firm a profit.

Senator MALONE. Do you think the company would take it unless they thought it did?

Mr. MASON. I do not think they would take it unless they thought they were going to make a profit.

Senator MALONE. That is right. So in other words the taxpayers take care of the overhead, and what is necessary above the price that you think the foreign minerals and materials are going to be purchased for.

Mr. MASON. I say that when available supplies are not forthcoming for security reasons, for any one of these reasons, then the Commission favored any one of a number of devices to bring those supplies about. I take it your own bill with respect to tungsten, chrome, and manganese ran in somewhat that same direction.

Senator MALONE. It certainly did, because they were going broke, and they were going out of business, and I do not like the method in the bill. But it is the only alternative as long as the State Department could keep the protection down so there is no protection for them, and there is none whatever.

Mr. MASON. I would favor this method as against an increase in tariff rates simply for this reason. This kind of an incentive is limited only to a part of the supply and consequently increases the cost for only part of the supply. If you increase the tariff, you are likely to increase the price for the whole consumption.

Senator MALONE. You know where the tariff goes. It goes into the United States Treasury. You can use it for any purpose you want to. It is not entirely lost. But when you pay a subsidy, it comes out of additional taxes.

Mr. MASON. Sure, that is where taxes go, into the United States Treasury. But most people do not like to pay taxes nor do I think do most consumers like to pay a higher price for copper, lead, and zinc.

Senator MALONE. If you examine these contracts, you will find they are giving contracts to developers in Africa at a higher price than you pay here.

Mr. MASON. That I would say is indefensible.

Senator MALONE. It is, but do you not see it is like rubber? Shortly after World War I we had no rubber at all. Then it came to a dollar a pound. They got what the traffic would bear. You are an economist.

Mr. MASON. Yes.

Senator MALONE. Now you have synthetic rubber, and they are complaining all the time that they cannot get a high enough price for the rubber in the Malayan States. I had evidence presented by a State Department official in 1947, when I held hearings—this same committee—and he advocated wrecking the rubber plants. I said to this man, "Am I hearing correctly?" He said, "Yes." I said, "Should you not go back and get another set of orders?" That is the same State Department we have now.

Mr. MASON. You and I are in complete agreement that the United States synthetic-rubber industry ought to be maintained on a full-time operating basis.

Senator MALONE. Why maintain it? Let it alone and sell it to somebody like we are doing. It will take care of itself.

Mr. MASON. Under private operation or whatever operation is most feasible. The point is that production ought to be maintained. May I proceed?

Senator MALONE. Yes, go ahead.

Mr. MASON. If the United States is to take full advantage of low-cost foreign sources of supply, barriers to imports should be low.

Senator MALONE. What would be your answer to getting low-cost supplies if we are out of the business in a certain material, and then they ask a higher price?

Mr. MASON. I would say if your best judgment is that the lowest cost way of meeting our requirements is by maintaining your domestic industry, that is the course you ought to take.

Senator MALONE. How would you maintain it?

Mr. MASON. In any number of ways. If you came to the conclusion that maintaining it through a high tariff was the lowest cost way——

TARIFF TO PROTECT DOMESTIC INDUSTRY

Senator MALONE. What do you mean by a high tariff?

Mr. MASON. To any kind of a tariff.

Senator MALONE. You are talking about a tariff that might make up the difference between the wages and the taxes and the principal factors here and the chief competing nation?

Mr. MASON. If it can be demonstrated that is the lowest cost way of meeting the requirements, I would say all right.

Senator MALONE. Over the years, what has been the experience of this country in rubber and in the GSA contracts and all the rest of

it? What is the experience in the way of diamonds. We do not produce diamonds. How do you get them? At a low cost?

Mr. MASON. I do not know what the cost of industrial diamonds is.

Senator MALONE. You know it is not low.

Mr. MASON. I do not know what the cost of producing industrial diamonds is so I do not know whether the price is high with respect to the cost or not.

Senator MALONE. You do not know anything about the diamond cartel?

Mr. MASON. Yes, I do.

Senator MALONE. You should if you are an economist.

Mr. MASON. I understood that the diamond cartel was mainly concerned not with industrial diamonds but other kinds of diamonds.

Senator MALONE. They include the field of industrial diamonds, too.

Mr. MASON. Brazil is a large producer of diamonds for our use.

Senator MALONE. Not too large. They say they might increase the industrial diamond production there enough so we would not need to be dependent on any nation outside of the hemisphere, because testimony shows that developments in that field would permit you to cut your use of industrial diamonds in two by other improved methods.

Mr. MASON. If that is the lowest cost by way of handling the problem.

Senator MALONE. I just mention that. There is no difference in zinc and lead. You just bought 100,000 tons of copper for 3 and 4 cents over the domestic market price. Why? Why do you do those things?

Mr. MASON. I can think of reasons.

Senator MALONE. I wish we could get some in the record.

Mr. MASON. I am not talking about the facts. I am talking about a possible explanation.

Senator MALONE. What would it be?

Mr. MASON. If you concluded that you are not going to get much more copper in this country by paying 30 cents a pound than by paying 24½ cents a pound.

Senator MALONE. That is silly.

Mr. MASON. I am not talking about the facts. I am talking about a possible explanation.

Senator MALONE. Stay as close to the facts as you can as to what you judge them to be.

Mr. MASON. Then I would say the domestic price should be maintained at 24½ cents. If you need copper and cannot get it except by paying 30 cents, then pay the 30-cent price.

Senator MALONE. You know we do not do it for that reason.

Mr. MASON. I do not know.

Senator MALONE. You can get all you can use from South Africa now.

Mr. MASON. We can now. We are talking about the situation at the time of the Korean war.

Senator MALONE. We are talking about the 30 cents a pound purchase made about 2 months ago. They just cleaned up the situation over there for the benefit of some people.

Mr. MASON. You mean when the same copper could have been purchased in this country at a lower price?

Senator MALONE. If you let it alone, it would have been purchased at a lower price.

Mr. MASON. Could we have gotten the 100,000 tons in this country?

Senator MALONE. Who else is going to buy it?

Mr. MASON. I do not know.

Senator MALONE. Maybe if we furnished England the money they could buy it and stockpile it and break our market again. After we get this new appropriation for mutual security and give them another couple of billion dollars, I think they could do it.

Mr. MASON. The principal existing barriers—I am talking about barriers to taking advantage of lower cost foreign production—are the tariff and the buy-American legislation.

Senator MALONE. What do they do?

Mr. MASON. These are the principal existing barriers to purchasing from low-cost sources of supply.

Senator MALONE. What purchases do you refer to?

Mr. MASON. I am talking about all domestic imports into the United States now.

Senator MALONE. You know that the Government does not pay the tariff.

Mr. MASON. Yes, I am not talking about the Government. I am talking about imports into the United States.

Senator MALONE. Yes.

Mr. MASON. Fortunately tariff rates are already low for most mineral imports. The Commission expressed the hope that they continue low and suggested permanent legislation independent of the Reciprocal Trade Agreements Act authorizing an elimination of import duties when the United States is substantially dependent on imports of a material and when such action is in accord with the national interest.

Senator MALONE. Who would judge when it was in accord with the national interest? Do you think the Congress should be the judge of that or the State Department?

Mr. MASON. I would say it was up to Congress to determine who the judge should be.

Senator MALONE. You are aware of the fact that the Constitution of the United States places in the legislative branch the responsibility to regulate duties, imposts and excises, that we call tariffs now, and that through the 1934 Trade Agreements Act that responsibility was transferred bodily to the executive. Are you in favor of leaving it in the executive?

Mr. MASON. I would be in favor of a renewal of the Reciprocal Trade Act.

Senator MALONE. Of course, you are aware that the two words "reciprocal" and "trade" do not occur in the act, and it has never operated in that way because no other nation ever keeps a trade agreement. Are you aware of that?

Mr. MASON. I was not aware that the name was not in the act.

Senator MALONE. No, it is not in the act. It was named by the same people, I think, that created the slogan "Trade, not aid." Do you know who that was?

Mr. MASON. "Trade, not aid"?

Senator MALONE. Yes.

Mr. MASON. It sounds like a British construction to me.

Senator MALONE. Both of them are for your information. They operate to British advantage. "Trade, not aid" was an expression invented by Chancellor of Exchequer Butler, who seems to be a smart fellow. Probably if we hired Mr. Churchill and Mr. Butler for a billion dollars a year a few years ago we would be ahead. They know how to handle foreign trade to the advantage of the British Empire. They know how to handle the preferential rates that prevent anyone of their members from trading direct with us on the same basis that they can trade with the mother country.

Mr. MASON. Yes.

Senator MALONE. You are in favor of that, I suppose?

Mr. MASON. No, I am not. I was a great opponent of that when I was in the State Department.

Senator MALONE. You do not seem to be in favor of making any adjustments on our part to offset it.

Mr. MASON. I think what we are talking about is our present tariff act, whatever you want to call it.

Senator MALONE. The subject really is as to how we benefit by writing off all these tariffs and protection. It puts us at the mercy of all these nations that fully protect themselves.

Mr. MASON. The chief benefit that I can see is that we are enabled to get materials from low cost sources of supply.

Senator MALONE. Are we?

Mr. MASON. It seems to me so; otherwise we would not get them.

Senator MALONE. We are paying what the traffic will bear each time and many times over the domestic price.

Mr. MASON. I am talking about imports into the United States which presumably are mainly accounted for by United States firms who want to make these purchases abroad.

Senator MALONE. I would have to tell you again that due to our policy we became dependent upon these nations and we are paying what the traffic will bear. Does that mean anything to you that we do not get the low price after we are out of business?

MACHINE TOOL IMPORTS

Mr. MASON. I would say American businessmen are awful fools if they continue importing if they have to pay a higher price for imports than domestic production.

Senator MALONE. You are talking about these raw materials. The machine tools have just started to come in. Probably within a year the machine tool makers who are starting to cry now will be screaming pretty loud, a good deal like the crockery people, and the mineral people and the wool producers. Nobody in his right mind would put $2 in the sheep business with free trade for all practical purposes with Australia, where it costs just 25 percent the amount to produce a sheep unit as it does in the United States.

Mr. MASON. I thought we had a sizable tariff on wool imports.

Senator MALONE. You do not have anywhere near what would be the differential between the cost of production there and in the United States. If you have it 1 percent lower, it means you must lower your wages and your investment in this country to meet it, or go out of business.

Mr. MASON. But I understand the tariff on wool imports is roughly 35 percent of the present value.

Senator MALONE. It may be because the price is pretty low. They are now advocating a subsidy just as you have here so that the people in the business can be prevented from expiring and putting us entirely in the hands of the State Department. I expect there are a good many of them that hardly would know the north end of a sheep going south.

Mr. MASON. Shall I continue?

Senator MALONE. Go ahead.

BUY AMERICAN ACT

Mr. MASON. The Commission considered the Buy American legislation to be an outworn relic of the depression psychology of the 1930's and long overdue for repeal.

The Commission gave careful attention to the argument for higher tariffs on security grounds; specifically the argument, and I quote from the report—

> that tariffs will assure continued operation of domestic mines or plants needed in wartime but too high cost to compete in a peacetime market.
>
> In the Commission's judgment, there would be few cases where a protective tariff would be the best device for satisfying security needs. For security, as for economic growth, the principle which the Commission advocates is to find the lowest cost way of meeting a need.

Senator MALONE. Did you in your elaborate study go into the amount of additional cost in the end product due to the tariff on a particular raw product?

Mr. MASON. No.

Senator MALONE. Would it interest you to know that in most cases you can hardly find it?

Mr. MASON. I know in many cases it is relatively small and in some cases it is relatively large.

Senator MALONE. In many cases you can hardly find it. Take the wool in a suit of clothes. The difference that the wool would cost that goes into a suit of clothes due to a tariff that is necessary to keep them in business in this country, you could hardly find it in the price of a suit of clothes. You are aware of that.

Mr. MASON. Yes, I am aware that the total——

STRATEGIC IMPORTANCE OF A GOING CONCERN INDUSTRY

Senator MALONE. The same thing applies in zinc, lead, and copper, and with other materials, like manganese in steel; you use an average of 12 to 14 pounds of manganese to the ton of steel. It is like the soda in the biscuits. Whether it costs you 10 cents a pound or a dollar a pound is immaterial, because you cannot find it in the cost of the biscuits.

Mr. MASON. I am generally aware of that fact.

Senator MALONE. It ought to be helpful to you in your study.

Mr. MASON. You should not let the price go to any level it could go.

Senator MALONE. What you are advocating, and what Mr. Paley got into a little bit is to keep up the economy of the other countries rather than concentrate on the benefit you get here.

Mr. MASON. This whole statement, Senator, as far as I am concerned, is directed to what is in the best interests of the United States.

Senator MALONE. Do you think it was in the best interests of the United States to cut the wool production in half in the last few years with the very policy you advocated? You will cut it much further even with the subsidies they are now advocating, because everybody in the business will get out as soon as they can because they think some Secretary of State will get out of the wrong side of the bed some morning and the subsidy will cease to operate. Do you think it is a good thing, regardless of there being very little difference in the cost of a suit of clothes or any end product made of wool, that we depend more and more on Australia and offshore areas for wool and finally when you get down to their size, where you are practically ineffective in the market, that they can raise the price, and it would not make much difference?

Mr. MASON. Assuming you take care of the security argument——

Senator MALONE. You are not taking care of it now. You cannot get the wool from Australia in time of war. You have cut the domestic production in two. So how do you say you are taking care of it?

Mr. MASON. The fundamental basis on which this whole argument rests is that the provision of ample supplies of materials for war and peace is a necessity. In order to get those ample supplies, the question that is important from that point on is how much does it cost to get them? I would never advocate making ourselves dependent on a foreign source of supply if we could not take care of the situation in case that source of supply is cut off.

Senator MALONE. You know you cannot take care of our war needs in wool and you cannot in manganese.

Mr. MASON. That would determine the situation as far as I am concerned.

Senator MALONE. How would you arrange it? You would arrange it for somebody up here in the Department of State to regulate a subsidy to keep them in business just on an existence basis?

Mr. MASON. I would suppose if you are talking about the——

Senator MALONE. What do you want in the way of subsidies——

Mr. MASON. I want the lowest-cost way of supplying what we need to have. That puts it in a nutshell.

Senator MALONE. No Executive order will induce anyone to invest money in a business. It puts the Government in the business to that extent, because the Government has to be a partner before private money will go in. Just like the Anaconda Co. in Nevada, they have a short amortization period and a 25-cent guaranteed price or they would not be there. But you would not need either one if you did not have free trade on copper. You think that is a good idea?

Mr. MASON. I suppose it is always up to Congress to change a tariff rate at any time if Congress is the rate making authority.

Senator MALONE. Congress is not under the plan that you advocate.

Mr. MASON. No, I take it you would like to have Congress.

Senator MALONE. You are recommending that it continue not to be.

Mr. MASON. That is true. What I understand to be your position is that if Congress did have this authority to make rates, that would give the investors the assurance they require. Congress can in any one year change the rates up or down or any way they want to.

Senator MALONE. An assurance by law is a different assurance than by executive order. If you have a record in Congress, which we did have over a period of 70 years, of a tariff, sometimes too low, sometimes too high, but generally adjusted on that basis, people would invest money in the business on a law, because you have to have hearings and various arrangements are made before the law can be changed.

Mr. MASON. Yes, but it can be changed.

Senator MALONE. It can be changed, but it has proved to be a much better floor under an investment than an Executive order. Would you agree on that or not?

Mr. MASON. I do not quite understand what you mean by Executive order. Are you talking about price floors and long-term contracts, or what?

Senator MALONE. Do you know of any long-term contracts with domestic producers that amount to the price you are paying for foreign products?

Mr. MASON. We have had them in the past and during wartime.

Senator MALONE. I do not know of any up to the price we are paying for foreign products, 30 cents a pound for copper.

Mr. MASON. Have you not got some fairly long-term contracts with respect to tungsten and chrome and manganese?

Senator MALONE. By virtue of the Malone bill because it was running out, and they would be out of business and their investments would be lost, we put the umbrella out 2 years more on the investment and they are all worried to death because they have no assurance that will be extended. I have no assurance. I am one of 96 Senators and 435 Congressmen. So you do not know what will be done from year to year. You advocate that sort of an arrangement?

Mr. MASON. Yes, I do.

Senator MALONE. Go ahead.

INSTABILITY OF MATERIALS MARKETS

Mr. MASON. Perhaps the most controversial of the Commission's recommendations in the foreign resource field had to do with instability of materials markets. Materials prices are notoriously unstable and, particularly in the case of minerals, instability may have serious consequences in loss of potential supplies as mines are prematurely abandoned because of temporarily low prices. What to do about market instability presents an admittedly difficult problem. The Commission opposed international commodity agreements with price and production controls and tended to favor arrangements that interfered as little as possible with materials production and with normal market processes. It considered the International Wheat Agreement, to which the United States is a party, to meet these requirments and gave tentative approval to international buffer stock arrangements for a limited number of materials. Such arrangements are designed to stabilize prices by purchases for stock when prices are low and sales from stock when prices are high.

If stabilization measures are to be attempted for internationally traded materials—and I admit that at this juncture I am doubtful about the wisdom of any such attempt—they should be undertaken in

ways that interfere least with the principle of meeting materials requirements from lowest cost sources.

Senator MALONE. That resembles the Wallace Ever Normal Granary that you are driving at there.

Mr. MASON. It is something like that.

Senator MALONE. Mr. Brannan's plan and some others.

Mr. MASON. It is a plan obviously for purchasing for stock when prices are low in order to sustain the market and selling from the stock when prices are high.

Senator MALONE. Who decides to sell?

Mr. MASON. I suppose some sort of executive officer authorized by Congress would decide.

Senator MALONE. That has proven one of the worst methods in the world. We thought under our stockpile law that when materials were in the stockpile they were sewed up. We have one flagrant case of an executive order that broke our own stock pile. It is just about impossible to sew an executive up so he cannot do that. He would have to operate on his own judgment or your plan would not work.

Mr. MASON. Senator, I am making about three statements here on this instability question. The first is that I think that instability of raw materials prices does present a serious problem. It presents a serious problem particularly in the mining industry where the fall of prices to low levels may lead to a premature abandonment of a mine which is difficult to get back in operation.

Senator MALONE. A certain amount of stability would be necessary.

Mr. MASON. That is the first statement I am making; the second statement is that it is extremely difficult to know how to deal with a problem of this sort if you are going to try to deal with it by Government action. The best kind of Government action is an action which interferes least with private decisions as to what to produce and what to consume. A buffer stock arrangement would be of that sort.

The third statement I make is that I am not at all sure in my own mind that this is a practical sort of arrangement. So I am doubtful really as to whether this problem of instability can be handled effectively through any device that I have yet seen put forth. There are only three more sentences here in my statement.

Senator MALONE. What is that last one that you recommended there that you are not sure of?

BUFFER STOCK ARRANGEMENT

Mr. MASON. This buffer stock arrangement.

Senator MALONE. Is that what you wish to supply there?

Mr. MASON. Yes.

Senator MALONE. Go ahead.

Mr. MASON. I said if such arrangements are undertaken they should interfere the least with the principle of meeting materials requirements from lowest cost sources.

It is for this reason that I am strongly opposed to any such stabilization device as the proposed sliding-scale tariff on imports of lead and zinc. By increasing the tariff rate a cent a pound with every 1 cent fall in the domestic price, foreign producers, including American producers abroad, in effect lose 2 cents for every 1 cent decline in the United States price. This is an attempt to put most of the

burden of price instability on foreign production with the inevitable consequence that investment in foreign materials development will be discouraged.

Senator MALONE. I am very much interested in your plan, but mostly I am interested in what you have already told us. Naturally these plans have been tried for 20 years now, and we are practically out of the mining business. You are out of the crockery business, and you are going out of many other businesses. You are out of the watch business and 500 other businesses are affected.

If you have a subsidy, it is new money you get from the taxpayers each year which means added taxes. They have to be distributed by somebody on some kind of a basis. Some one has to be the judge. There have to be appropriations year by year for these subsidies. You see the fight on the Senate floor and the House floor on the subsidies for crops. They are not assured from year to year. Foreign products are coming in, the barley and the wheat and the oats and the potatoes and you are buying it, not at a price which would yield a good profit for this foreign production, but at the price you buy everything else and then you store it. You are buying Denmark butter at the same price you buy it here, either storing ours and eating theirs or vice versa. There seems to be no answer to it. But in the case of these materials that you do not produce quite enough of, you are not trying to put a subsidy on to buy more than you use; you are tring to equalize the price. When you do that through a duty or a tariff, the duty that the Constitution of the United States laid down, that is new money that goes into the Treasury of the United States.

You are a very eminent economist, but you have not been in this business for very long. I have been in it for 30 years until I feel an inferiority in a lot of ways. You talk about assumptions. Anyone not in the engineering business seems to consider it an exact science. It is not. You are never any more correct in your ultimate solution of the problem than in your assumptions.

You assume the strength of materials. You assume that concrete has a certain strength, and it has the strength up to a certain amount. It depends on the materials you put in to mix it. We make assumptions and then a design. Your ultimate design is just as accurate as your assumptions.

But in this case we seem to get away from a policy laid down by the Constitution of the United States. When you set this duty as you had for 175 years you took the profit out of sweatshop labor. We have many briefs written by eminent Government officials and professors saying that what we want to do is raise the standard of living throughout the world. What you are actually doing—and I have visited all these nations—you are holding their standard down, because the empire-minded nations again have the vested interest in the sweatshop labor. When they have to pay their labor more, it takes some of the profit away. Whenever they can get this labor with our machinery it increases the profit to what the traffic will bear. That is what they get.

Do not make any mistake about that. That theoretical idea you have of a fair profit to them, and of our getting the goods cheaper is not borne out by the facts that we have in the record. They are much smarter than we are in foreign trade. Many of these nations have been making a living by their wits for 150 years. So when you take the profit out of sweatshop labor with that duty, and they pay that into the

Treasury a few times, they might get the idea that raising their wages might not affect their profit, and it might effect an increase in their markets at home.

That is the way we have increased ours. I have compared Mr. Ford II with Mr. Ford I. Mr. Ford I one day woke up and came down to the plant and said they cannot buy these Fords at $2.50 a day and from now on the minimum wage is $5.00. If you are as old as I am, you probably remember that incident. If Mr. Henry Ford II were doing that in England, he might get someplace, because they could buy some of his Fords. Every man and woman working in this country is in the market for some kind of an automobile. None of them at foreign wages are in the market for an automobile, but they would be if they were raised. So what you are trying to tell us, it seems to me—and you have told us, and the record will be clear—that you think we should just do away with all attempts to even the standard of living, wages and taxes, or anything else, by law and drop all tariffs and import fees, and duties, and get everything where we can get it cheapest, but simply have an eye out for our security, so that it will be available to us in time of war.

Mr. MASON. That is substantially correct. I would be quite content myself to see tariff rates remain at the present level.

Senator MALONE. They do not amount to anything there. As you well know, because you are an economist. Therefore, if they are 1 percent lower than that differential either you are going out of the business or your labor and your investment must come down to that point. Is that not about true?

MASON'S POSITION ON TARIFFS

Mr. MASON. The present tariffs are very low, and I would be content to see them low.

Senator MALONE. They have nothing to do with that differential of cost.

Mr. MASON. They do not have, and I do not think they should have. I would support wholeheartedly President Eisenhower's own position, as I understand it.

Senator MALONE. What you want is one economic world, all trading with each other on a basis of bringing their materials into our highly developed market with no evener to make up any difference in the cost due to the wages, taxes, or any other important factors.

Mr. MASON. I would make a few exceptions, but I do not see the point——

Senator MALONE. You said on security grounds.

Mr. MASON. No, I would make a few other exceptions. I would make a few exceptions to the Senator's generalization on infant industry grounds or various other grounds. However, I would be quite content to accept his statement that I favor existing low tariffs on imports.

Mr. ADLERMAN. I would just like to get some things in the record here.

Coming back to the question of the basis for the estimates for the next 25 years—I think that is covered on page 2 and 7 of your report.

Mr. MASON. It is developed in detail in volume 2.

Mr. ALDERMAN. I take it that the base year that was used was 1950; is that correct?

Mr. MASON. That is right.

Mr. ADLERMAN. I was just wondering whether or not that base year was a year that was not characterized by scare buying, rapid price rises, inflation, shortages, and heavy demand for metals and minerals for rearmament and stockpiling for defense. Would not a year of abnormal supply and demand distort the estimates based on the records of that year and give an erroneous picture of the future requirements?

Mr. MASON. It would. I think that was taken into account. It was taken into account principally this way. By pointing out that in 1950, the probability was that the production of durable consumer goods, the production of durable investment goods was higher than a trend line would indicate. Consequently, that was taken into account.

Mr. ADLERMAN. In other words, that would make your estimate conservative; is that correct?

Mr. MASON. You would have to scale down the consumption of materials, particularly the minerals in 1950, to get a true trend line of growth rates and that was done.

Mr. ADLERMAN. That naturally would distort the entire estimate, would it not?

Mr. MASON. Yes, it would if you did not take account of it, but it was taken into account.

Mr. ADLERMAN. Ordinarily you would not want to rely on that estimate.

Mr. MASON. I would want to scale down the consumption rate, particularly of minerals, in 1950, in order to make a true trend calculation of probable future requirements.

Mr. ADLERMAN. I notice in volume 2 at page 111, which was written by Professor Harberger that he pointed out that "the forces which govern economic growth and development are themselves not regular enough to enable us to allege that a 60 percent growth is likely while a 75 percent growth is not.

Mr. MASON. That is right.

Mr. ADLERMAN. Therefore, any predictions that you arrive at are really rather vague and indefinite?

Mr. MASON. They would be better described as projections based on certain assumptions rather than predictions. I think the Commission was quite careful in pointing that out. These were not predictions.

Mr. ADLERMAN. Do you think that policy should be based on such vague and indefinite assumptions, conclusions, and projections.

Mr. MASON. I think that it is the only way that policy is usually made if you are talking about long-range policy. Obviously you have to make some kind of judgment as to what is going to happen, and you make the best judgment you can.

Mr. ADLERMAN. That is the basis on which this was done?

Mr. MASON. Yes.

Mr. ADLERMAN. Then I notice that in volume I, page 26, the Commission recommended that heavy emphasis should be placed upon analysis by professionally trained economists and a study of geologic, technological, and other scientific developments and prospects should

be related more than it has been in the past to economic conditions and opportunities.

Should not academic learning be supplemented by the experience and problems of industry in production, rather than just by economists who have no experience in problems of production?

Mr. MASON. I would say certainly that is so.

Mr. ADLERMAN. I think that you did explain that you did consult with people in the production field?

Mr. MASON. Yes, we had many businessmen, many geologists, and many mining engineers who came in to advise us.

Mr. PALEY. Pardon me. May I at this time submit a list of the consultants for the record?

Mr. ADLERMAN. Is this the list you were going to supply?

Mr. PALEY. This is a new one.

Mr. ADLERMAN. If I recall correctly, earlier in the day in the conversation with Senator Malone, you were going to supply the names and backgrounds of the people in the staff. This is a separate list?

Mr. PALEY. That was staff people. I have a long list of industrial people and so-called specialists.

Mr. ADLERMAN. We would be glad to receive that.

Mr. PALEY. That is in the report and I should like very much to submit it in the record.

Mr. ADLERMAN. You will submit that to us by writing us a letter.

Mr. PALEY. Fine.

(The information referred to follows:)

ATTACHMENT D

ADVICE AND CONSULTATION WITH INDUSTRY

The Commission, in its study of materials problems, used four methods for obtaining the views and expert knowledge of industry and of individuals with engineering and practical business experience:

1. It called conferences of industry representatives and staff and commissioners consulted frequently at all stages of the work.

2. It sent questionnaires planned with the assistance of industry people to lists of companies selected with industry assistance.

3. It obtained research studies from industries and from industrial research institutions.

4. It obtained specific views of leading industrialists, mining, and businessmen on drafts of sections of the report and its recommendations at various stages in its work.

A list of the individuals, or the companies of individuals, is given below. Where the individual's name is omitted, it is because his opinion was given off the record, and a commitment was made by the Commission to hold the views or opinions confidential, to be used for general guidance of the Commission. These views are included in Executive files, at present in the possession of the Office of Defense Mobilization.

1. CONSULTATION AT CONFERENCES

The following is a partial list of people consulted in conferences by the Commission and staff:

P. G. Agnew, consultant, American Standards Association.
Horace M. Albright, president, United States Potash Co.; chairman, National Minerals Advisory Council.
Douglas H. Allen, importer.
Julian Avery, consulting engineer.
Eugene Ayres, research and development department, Gulf Oil Co.
George Bateman, consulting engineer, Canada
Alexander C. Brown, president, Cleveland-Cliffs Iron Co.
Cecil Gurrill, Creole Petroleum Co.; and others
Walker L. Cisler, president, Detroit Edison Co.

E. G. Collado, assistant treasurer, Standard Oil Co. (New Jersey)
Dr. Donald Davidson, vice president, E. J. Longyear Co.
George W. Dean, state forester, Commonwealth of Virginia
S. M. DuBrul & Associates, General Motors Corp.
E. L. DeGolyer, consulting geologist
DeVere Dierks, executive vice president, Dierks Lumber & Coal Co.
George A. Garratt, dean, School of Forestry, Yale University
Dr. A. M. Gaudin, Massachusetts Institute of Technology and consultant
Dr. Willis Gibbons, director of research, United States Rubber Co.
A. J. Glasgow, vice president and general manager, Brooks-Scanlong, Inc.
Col. W. B. Greeley, vice president, West Coast Lumberman's Association
Dr. Zay Jefferies, vice chairman, Metallurgical Advisory Board
Ira B. Joralemon, consulting geologist
Serge Jurenev, vice president and economist, Continental Oil Co.
Evan Just, editor, Engineering and Mining Journal; now vice president, Cyprus Mines
J. L. Kugleman, acting woodlands manager, International Paper Co.
George A. Lamb, manager business surveys, Pittsburgh Consolidation Coal Co.
Dr. C. K. Keith, geologist
A. I. Levorsen, consulting geologist, Tulsa, Okla.
Walter Levy, petroleum consultant and economist
Dr. W. K. Lewis, Massachusetts Institute of Technology
Paul F. Linz, chairman of board, South American Minerals & Merchandise Co.
Dr. Hugh McKinstry, geologist, Harvard University
James L. Madden, president, Hollingsworth & Whitney Co.
L. F. Marek, vice president, Arthur D. Little, Inc.
Clyde S. Martin, chief forester, Weyerhaeuser Timber Co. and chairman of Forest Industries Council
Edward W. Morehouse, vice president, General Public Utilities Corp., New York
Arthur Notman, consulting engineer
Robert G. Page, president, Phelps Dodge Corp.
Dr. Dickson Reck, consultant, American Standards Association
V. H. Schnee, executive secretary, Metallurgical Advisory Board
Dr. Philip J. Shenon, dean, department of mining and engineering, University of Utah
Dr. Morris M. Slotnick, Humble Oil & Refining Co., and others
Philip Sporn, president, American Gas & Electric Co.
Francis Adams Truslow, late chief for the United States of the United States-Brazil Joint Commission for Economic Development; president, New York Curb Exchange
Dr. John W. Vanderwilt, president, Colorado School of Mines
Samuel H. Williston, vice president and treasurer, Cordero Mining Co.
Howard I. Young, president, American Zinc, Lead & Smelting Co.

In addition, individual members of the staff, in the preparation of commodity studies, and similar contributions, freely consulted with industry representatives both for information and to check specific findings and views.

2. QUESTIONNAIRES SENT TO COMPANIES

In the minerals and metals field a long and detailed questionnaire was developed with the professional assistance of Elmo Roper, famous pollster, and the industry experience of Evan Just, then editor of Engineering and Mining Journal. It was sent to 275 companies and individuals. The questions covered some 40 pages; some 25 separate commodities were represented in the list of companies and individuals selected for their special knowledge of these commodity situations. The list of companies and individuals was developed with the assistance of experts of the National Minerals Advisory Council and the United States Bureau of Mines with a view to representing companies of various sizes and interests in their industries.

About 60 percent of the questionnaires were returned with full and, in many cases, detailed replies.

To companies and individuals in the timber resources field the Commission sent out 171 questionnaires of the same general type as that on minerals and metals. Other successful questionnaire efforts were directed to research directors of companies, and to officials of State governments and State universities, on needs for industrial water.

3. RESEARCH PROJECTS ASSIGNED TO INSTITUTES AND COMPANIES

The Commission assigned special projects to Battelle Memorial Institute, which made a total of 41 reports on minerals and metals; Arthur D. Little, Inc.; Standard Oil Development Co.; Universal Oil Products; Koppers Co.; American Standards Association; and a panel formed by the National Research Council.

A study which assisted basically in providing industry background for the foreign supply section of the report, was prepared through interviews with officers of some 50 companies in the business of producing materials in foreign countries, and with executives of banks, underwriters, brokers, management engineers, and law firms with experience in the foreign materials field.

4. REVIEW OF DRAFT SECTIONS OF THE REPORT BY MEMBERS OF INDUSTRY

During preparation of the report itself, the Commission went to a great many members of industry and asked them, on an individual and confidential basis, to read drafts of parts of the report on which they had expert knowledge and to write down their comments and suggestions. Some 65–70 members of private industry were consulted in this way, for the dual purpose of assuring factual accuracy and of obtaining informed judgments on how subjects had been developed.

ESTIMATED NATURAL RESOURCE RESERVES

Mr. ADLERMAN. Just for the record again, in volume II, page 136—and I do not want to go into length into it—I call attention to the careful way in which the chapter was compiled by the Geological Survey and the Bureau of Mines in contrast to the remainder of volume II. What I mean is this. Every estimate made by the Geological Survey and the Bureau of Mines is carefully qualified, and the experts took great pains in appraising their work. They were very careful in defining what they meant by reserves. They pointed out that a reserve is a constantly changing factor and that actual reserves cannot be put down as a figure on a piece of paper. They depend on technology and vary from day to day as practices change, and new techniques are developed.

I think we can point out that at the turn of the century the copper reserves in the United States were largely those found in the Upper Peninsular Region of Michigan.

Mr. MASON. Yes.

Mr. ADLERMAN. They have all since been largely depleted but technogoly has made the submarginal material in Nevada and Utah our principal copper reserves of today.

Would you be so bold as to prophesy similar developments could not take place in the future?

Mr. MASON. I certainly would not prophesy anything of the sort. By the way, I share your admiration for the care with which the Bureau of Mines and the Geological Survey made these estimates. They always distinguish clearly between indicated and proved reserves and inferred reserves. I would only disagree with you possibly in your statement that other parts of volume II were not as carefully prepared.

Mr. ADLERMAN. Of course, that is a question of interpretation and a question of conclusion.

Mr. MASON. That is right.

Mr. ADLERMAN. But it seems pretty clear to me that the way the engineers handled the question of reserves and the statistics and the estimates was entirely different from the way the economists, if I may say so, handled them. They, as you say yourself, use these projections and vague estimates which are not too reliable.

Mr. MASON. Yes; if you are talking about such things as proved reserves, you have a factual basis which you simply do not have if you are attempting to project some future growth and development.

Mr. ADLERMAN. Did you take into consideration the latent reserves?

Mr. MASON. All of our reserve information came from the sources you have now quoted.

Mr. ADLERMAN. As I say, the Bureau of Mines and the Geological Survey are very careful and very particular in what they say. Did they give you any idea of what the latent reserves might be?

Mr. MASON. You mean beyond proved, indicated, and inferred reserves? Inferred reserves get into a debatable area.

Mr. ADLERMAN. I am talking now about these latent reserves, the material under the new rock, so-called, of the United States that nobody knows anything about.

Mr. MASON. They didn't know anything about it. We did not know anything about it.

Mr. ADLERMAN. Did you take them into consideration when you made your recommendations?

Mr. MASON. We certainly took into account the possibility that ore reserves completely unknown to anybody now might be discovered and probably would be discovered in the course of time.

Senator MALONE. Did you take into account that the record shows during the whole history of mining and petroleum production that if the profit incentive was there, that regardless of how much you used or mined, you always had more reserves than you ever had in history?

Mr. MASON. I was tremendously impressed by that. I have been impressed by that as an economist for a long time. I have looked at the oil industry and what happened to their estimates of proved reserves. That was very much in my mind.

Senator MALONE. As you and Mr. Paley said many times, we should get materials wherever we can get them the cheapest and whether you are getting it at a low cost or not, now they know that they can compete and lower their price, whether it is oil, zinc, lead, copper or crockery, and they will ultimately get what the traffic will bear. That may be twice what that costs them and get a reasonable profit. As long as our investors know, they can come down and beat their ears off, private money will not go into the business. So we come back to Mr. White's estimates which were very liberal, according to the information that he had. But since that time we have doubled, trebled, and quadrupled the daily use of oil. I think I can say that.

Mr. ADLERMAN. I think that it is a safe assumption.

Senator MALONE. We have 2¼ times the reserves now that we had when Mr. White put out his statement on which national policy was based when it got to the President. Are you aware of that fact?

Mr. MASON. I am very much aware of that fact.

Senator MALONE. Mr. Ickes used to say, "Let us import our oil, let us save this oil. We have to have it for national defense."

I made three speeches in 1948 about that business. One reason I wanted to come to the Senate was that I got so mad about the things they were doing.

OIL RESERVES

The first paragraph of the speech I made in San Antonio, Tex., and in New York before the Oil State Governors, and in Chicago before the American Petroleum Association, read like this. It is impossible to run out of petroleum fuels in this country except by design. It is impossible. Why? Because we had 26 billion barrels then, or some fantastic amount, nearly twice as much as Mr. White said, and I did not know about his letter, because we dug it out of the Princeton University library only recently. Then I said we have 200 billion, and we think we have 350 billion barrels of oil still undiscovered and we have 1,000 years of petroleum fuels in coal. It costs a little more. But that still is not an important factor, as with important improvements in laboratory work, it is conceivable in large production it might even come down to the cost of underground oil.

Mr. MASON. It is quite probable.

Senator MALONE. That means, I said, that you can turn your oil companies loose. They have the tax break of 27½ percent depletion, and probably you will not run out of underground oil reserves for 100 years, and I do not believe you will. But if you did, you still have more petroleum fuels than you ever could use in this country if you want to get them. In peacetime you could get them any time you want to. So what are we talking about. What is the subject? Do we want to hold the price down so you cannot get into the petroleum business here? I know you are both for keeping us in the oil business to the extent of security. But neither one of you are for keeping the oil business beyond that amount, are you?

Mr. MASON. That makes quite a lot of difference in the case of oil, which presumably is not an item that can be stockpiled. So there I think you really have to depend on sources of supply in the nonvulnerable area.

EFFECT OF LOW-COST IMPORTS ON DOMESTIC PRODUCTION

Senator MALONE. How would you do that? Right now the imports of oil in the Middle East are stepping up every day. They have Texas down to 17 days a month.

Mr. MASON. Most of our imports come from Venezuela.

Senator MALONE. I would not say that most of our imports come from Venezuela. Maybe at the moment, but they are increasing from the Middle East every day.

Mr. MASON. Roughly I would think not more than 50,000 barrels a day.

Senator MALONE. I would just say to you this, that there is no limit as to how much they can bring in and much cheaper than you can produce it here. Do you know that?

Mr. MASON. I know it is the lowest cost source of supply in the world.

Senator MALONE. When that time comes, do you want to pay a premium on the oil here in the nature of a subsidy, or would you want some kind of a protective device?

Mr. MASON. What I would hope is that we would be dependent as much as we have to be dependent on foreign sources only on Venezuela and to a minimum extent on the Middle East. I agree with your analysis of the oil industry. I am aware of the oil shale and coal

possibilities. I do not think really we need to fear very much with respect to the future of our oil supplies.

Senator MALONE. Except if your imports continue to increase and take the profit out of the domestic production, you will quit your exploration and you will shut these oil wells down. History shows that if you shut them down, in many cases if development stops, you lose your trained workers, you lose your setup, your organization, just as you do in the textile business or the watch business. Finally when you need it, you are unable to come back.

Mr. MASON. I quite agree, Senator, but I do not think the oil industry is in that state or is going into that state.

Senator MALONE. That is what you do not think, but the people in it really do.

Mr. MASON. Do they really?

Senator MALONE. The independents do. The majors that own the oil in the Middle East do not care what we do in Congress and others are urging Congress to go ahead with free trade. But the independent who will shut down and have no investments abroad are definitely afraid. They are afraid they will lose their workers and that they will not be able to reach the necessary production in wartime.

The coal people are in the same condition. No one objects, or at least they have no ground to object, if the local oil production paying the same wages as a coal mine shuts down a coal mine. But if it is due to imports that might be shut down in time of war, then you are involved in problems of the national defense.

Mr. MASON. In the oil industry, as I say, I do not think we can afford to become dependent on Middle East sources of supply to a very large extent.

Mr. PALEY. Mr. Chairman, may I say one thing? I may have given the impression this morning that in all cases where I think we have to protect the continuation of production for security factors that other devices than tariffs would be preferable. I think by and large from the standpoint of my thinking, that is true, but I want to have on the record that there may be circumstances where tariffs would be the cheaper method, and the more effective method of giving protection to those industries which we want to keep in being, irrespective of cost, because of the need of the materials that they produce for our future security.

Senator MALONE. In that regard, I presume, then, that you would accept most of the materials on the list of critical materials that are necessary in time of war, and if you are dependent on countries that you are unable to reach or at least uncertain of reaching in time of war, you would exempt those materials and perhaps the tariff might be all right?

Mr. PALEY. I think each material would have to get separate examination, as a matter of fact, in order to get all the factors which would have to be considered before a determination could be made.

Senator MALONE. I think that is a very thoughtful statement. Then every material in the United States, whether it be a textile material, cotton, wool, or a machine tool, you would put in a category of free trade? You would get it wherever you could get it the cheapest?

Mr. PALEY. The point I am trying to make now is that in talking about those exceptions I do not want to rule out tariffs as one pos-

sible way of giving the kind of protection on raw material we were discussing.

Senator MALONE. Who should decide whether tariffs ought or ought not to be applied?

TARIFF CONTROLS SHOULD BE LEFT UP TO CONGRESS

Mr. PALEY. It is up to Congress to decide whether it shall have the authority and power to do that, or whether it should delegate it to others.

Senator MALONE. By others, you mean another branch of the Government?

Mr. PALEY. I suppose so; yes.

Senator MALONE. There is a great difference. You know it has already delegated power to the Tariff Commission, an agency of the Congress, just as the freight rates are delegated to the ICC, which is an agent of the Congress. All that was told to the ICC was that you shall set the freight rates uniform and on the basis of a reasonable return on the investment. There was a time when there was a different rate for every important shipper. Since the ICC was created the principle of a reasonable return on an investment has been followed, and most of the State commissions have the same law—I served 8½ years on one in Nevada—and they work on the same principle, a reasonable return on the investment. The Commission goes into original cost, replacement value, amortization costs, interest, and maybe 100 factors. The same principle applies to setting tariffs.

The Tariff Commission is an agent of Congress which laid down a method of operating on a principle, not dependent on somebody's judgment each day, who knows nothing about the business.

Let me say here and now that an engineer that knows the mining business—and I do not put myself forward as knowing the mining business—would only know 1 or 2 mines in detail, because they are the ones he is operating with. In a different kind of mine he would be out of his sphere and is lost. But he knows enough about the business to know when he does not know, and that is something they do not know in Washington. They will never learn.

So I want to say to you that it is very important to me in this hearing to hear you say who should be the judge. The Tariff Commission is the agent of Congress, and they would be the judge under the policy laid down by the Congress.

Mr. PALEY. I have not made an examination of the issue you are bringing up now as to which branch of Government should have control over tariffs.

Senator MALONE. But you recommend a continued jurisdiction of the executive branch, and the Constitution put it in the legislative branch. So if you did not understand it, why the recommendation?

Mr. PALEY. I am recommending the continuation of the more liberal trade policy we have been living under.

Senator MALONE. Will you define that trade policy? We have been swamped with the word "liberal" for 22 years. We were mostly liberal with other people's money.

Mr. PALEY. Lower tariffs.

Senator MALONE. In other words, lower than any differential cost of production brought about by the factors of wages and taxes and other factors affecting production. You want a tariff clear below that point?

Mr. PALEY. My position on tariffs I stated clearly.

Senator MALONE. I know you did, but you brought up the tariff business again. Who is going to judge now what materials shall be treated with a tariff and who is going to judge which will be treated with a subsidy and the other methods that you have not been too clear about. You think there might be other methods. Who is the judge?

Mr. PALEY. At the present time as to tariffs, the executive branch through the powers given to the executive branch by Congress.

Congress.

Senator MALONE. And you want it to continue there.

Mr. PALEY. I think the arrangement as we have had it, and as recommended by the present administration, is a good one.

Senator MALONE. Mr. Mason, you wrote a book in 1946 on commodity agreements published by the Committee for Economic Development?

I would like to have your books on economics autographed by you. We have this one here, but I cannot keep it in my office, because it is not mine.

Mr. MASON. I will see you get it.

Senator MALONE. On page 265 of your book, you said:

> To enable the machinery to function, it will be necessary to reshape not only commercial policies but policies heretofore considered as belonging in the field of domestic regulation.

What did you have in mind?

CONFLICT BETWEEN DOMESTIC AGRICULTURAL POLICY AND FOREIGN ECONOMIC POLICY

Mr. MASON. There seemed to be a great conflict between our domestic agricultural policy and the kind of foreign economic policy we were trying to advocate. We have a domestic policy that maintains a high support price for agricultural products and consequently there has to be tariff rates or quotas on imports of agricultural products and this creates a conflict in the Government that has to be reconciled in some way.

Senator MALONE. In other words, we have lowered the tariffs or practically have no tariffs on agricultural products, so we are really stabilizing the agricultural production of the adjacent nations.

Mr. MASON. We have quotas on various agricultural imports.

Senator MALONE. Not all of them.

Mr. MASON. That is right.

Senator MALONE. Then it is up to the Executive to exercise judgment. I remember, and possibly you remember last year the oats were coming in. I do not suppose anybody in the White House would know a bushel of oats from a bale of hay. But when there was enough pressure, he said, "I will fix that." So we set down some kind of a limit and then raised it again.

Mr. MASON. I believe, sir, in making this statement I was talking about the obvious conflict between our domestic agricultural policy and our commercial policy.

Senator MALONE. You said in volume 1, chapter 15, page 87, of the Commissioners' report—

> The United States has not ratified the treaty, (Havana charter), but under a resolution of the United Nations Economic and Social Council it is bound with other nations to recognize chapter 6 as a general guide.

How are we bound by that general charter?

Mr. MASON. I do not think I can answer that question very specifically. I think the situation is that the United Nations Social and Economic Council is authorized to make a renewed investigation, particularly of the cartel and commodity agreement problem. Chapter 6 dealt with cartels. They have been making such an investigation over the past year.

Senator MALONE. What part did you play in the arranging of these economic affairs in 1945? You were deputy assistant to the Secretary of State, then?

Mr. MASON. Yes. Will Clayton was the Assistant Secretary. I was the chairman for the previous couple of years of an interdepartmental committee working on cartel problems. Of course, as Will Clayton's deputy, I had some general oversight of the economic work of the State Department.

Senator MALONE. Did you play any part in preparing the proposals that led to the International Trade Organization?

Mr. MASON. No, because I was out of the Department by that time. I left the Department in June 1945, and all these ITO negotiations took place between then and I believe roughly 1947 and 1948.

Senator MALONE. Did you approve the negotiations and the idea of the International Trade Organization?

Mr. MASON. I had grave misgivings about it.

Senator MALONE. You were economic consultant to the State Department in 1946 and 1947. What did your work include?

Mr. MASON. In 1946 I went to Germany to advise the Department on their economic policy with respect to Germany. In 1947 I was General Marshall's chief economic adviser at the Moscow conference.

Senator MALONE. Did you have anything to do with the Morgenthau plan in Germany?

Mr. MASON. I kept fighting it all the time.

Senator MALONE. That would be a bright spot in your record.

Mr. MASON. The last time I saw Harry White was in a battle between the State Department and the Treasury on the Morgenthau plan.

Senator MALONE. I think we have covered most of these points we had in mind. I want to clarify one further statement.

> The Commission believes that an elimination of the tariff on many industrial minerals would be a benefit to the United States quite apart from reciprocal action from other countries.

That is what is stated in the Commission report. I understood you to say there ought to be something done about it if they did not keep their part of the agreement. But this would indicate it makes no difference, that we would benefit anyway.

Mr. MASON. That statement refers to a sentence in my own statement here in which I said that the Commission thought that tariffs

might be reduced on minerals when we have inadequate sources of supply to meet our requirements, if that tariff reduction was consistent with the national interest. That is a very vague statement, and as far as I am concerned does not mean anything.

Senator MALONE. Most of the statements here do cover a lot of territory and are not specific. You say permanent legislation should be enacted authorizing unilateral elimination of import duty on any industrial material in either crude or refined form wherever it is determined that the United States is or is expected to become substantially dependent on imports of material, and that such action is in accord with the national interest. Procedures for making such determinations shall be specified in the legislation.

That would be in addition and added to?

Mr. MASON. That is right. Whatever that statement means depends entirely upon how you interpret "in the national interest."

Senator MALONE. Who determines the national interest under your ideas of legislation?

Mr. MASON. I suppose in a situation of this sort, the Office of Defense Mobilization operating in the White House under general legislative direction from Congress would make a recommendation.

TARIFF HISTORY

Senator MALONE. Would you not suppose that the 175 years of experience we have had with the Constitution of the United States which put in the legislative department the regulation of foreign trade, the adjustment of duties, imposts and excises shows that it may be the proper agency to determine the national interest? Many of us believe it is a proper place, because of the fact that every precinct in the United States is represented in the Senate and House. I have referred to Nevada simply because $40 million is expended out there for the production of copper by the guaranteed unit policy because of the very shortsighted policy adopted here. I am familiar with every area in Nevada, and many areas out of it. Someone on the Senate floor and someone in the House is absolutely familiar in detail with every area in the United States of America, and what it does to the economics of that community when you make a major change in a policy on imports or international trade.

Do you suppose the writers of the Constitution had some idea that they knew what they were talking about, rather than putting it in the executive department under the Secretary of State, who does not represent any place, and is not really familiar with any place in the United States. He does not know what changes in the tariff would do in destroying the investment in schools, the investment in transportation, the investment in the utilities by remaking the industrial map of the United States in his own image?

Mr. MASON. I always thought the framers of the Constitution knew very much what they were doing.

Senator MALONE. I still do.

Mr. MASON. The only statement I can make is that Congress after 150 years of experience with one method of tariff making decided to go to another method.

Senator MALONE. They decided with a very strong minded President, and a very weakminded Congress.

Mr. MASON. Then the people of the United States ought to elect a stronger Congress.

Senator MALONE. I believe so. They ought to elect a Congress that ought to run their own business and take their own responsibility.

Mr. MASON. I believe so. Senator, could it be possible to answer the other questions in writing?

Senator MALONE. I will ask this one. On page 86, of your report:

> The Commission views a strictly national stabilization policy as impracticable and highly undesirable.
>
> The Commission is convinced that the solutions to the problem of materials market instability must be sought through international agreements in which the United States will have to take a leading part.

Was this to be done by the International Trade Organization or the International Materials Conference?

Mr. MASON. No, I do not suppose so. I suppose a separate organization would be set up, the nature unspecified insofar as this report is concerned.

Senator MALONE. What you are talking about is a cartel of the whole world. This is like the latest proposal before the United Nations suggested by a committee of experts and endorsed by the Argentine.

Mr. MASON. No, I am not. I am talking about an arrangement with countries that are both importers and exporters of materials.

Senator MALONE. What would they agree on?

Mr. MASON. To purchase when the price is low and sell when the price is high.

Senator MALONE. And who would be the judge?

Mr. MASON. Congress, if it authorized that, could either lay down fairly strict principles and allow very little discretion to the administrators——

Senator MALONE. In other words, you would run the business from Washington, D. C., and regulate the price. That is what you are in favor of?

Mr. MASON. This kind of recommendation is one that I am dubious about myself, and I think Mr. Paley has said——

Senator MALONE. I think the whole country will be dubious about it when they hear about it, and I hope they do.

Mr. MASON. Perhaps so.

Senator MALONE. We will ask you in writing for anything further we may wish that you can provide. Thank you.

Mr. MASON. Thank you.

Senator MALONE. I would like to ask you, Mr. Paley, the rest of these questions that we have listed from a study of your report.

BUFFER STOCK TYPE OF CONTROL

On page 90, volume I, is contained the statement:

> Military stockpile operations might conceivably jeopardize proper functioning of international buffer stocks, because large-scale sudden purchases might prevent buffer stocks from limiting extreme price rises, from acquiring stocks of their own, or might cause a premature and risky depletion of buffer inventories. Sales from military stockpiles might be on a scale sufficiently large to overtake the stabilizing capacity of buffer stocks.

Would you recommend then that the stockpile in this country for our national security would defer any purchases in favor of the buffer control, or how would you run it?

Mr. PALEY. Senator, I am not recommending the buffer stock type of control as I have repeated two or three times today. I said I had very serious misgivings about it. I think it would be a mistake if it were introduced. I think it would be, at times at least, in contradiction to the free-price competitive method which we have relied on so successfully during the many years of our industrial growth.

Senator MALONE. I think you take the competition out of everything when you supply the guaranty price through a subsidy. How do you think you can have private competition when you are taking it out deliberately?

Mr. PALEY. I would not take it out under just any circumstance; only when the reasons are based on military security.

Senator MALONE. I would say to you you are taking it out with the trade agreements. How are you going to have competitive action in this country against something that comes in cheaper than anybody can manufacture?

Mr. PALEY. You are talking about the tariffs that might be imposed in one way or another. I do not know about the mechanism now being employed by the executive branch in making those determinations. I know how it operates. I am not sure what the mechanism is.

Senator MALONE. I will tell you what the mechanism is. They go to a country and negotiate. Often they deliberately apparently go to the country that is not the major producer of the article they are trading on, and lower the tariff to that nation on this particular item. I think we made a tariff agreement to lower tariffs on tungsten with Cuba, did we not?

Mr. ADLERMAN. I am not sure.

Senator MALONE. So most people would say it does not make any difference. But you have what they call a most-favored-nation clause, so that every nation in the world gets the same concession you give to that nation, whether it produces any tungsten or not. They have that authority with every tariff there is.

Mr. PALEY. Must that be endorsed by the President?

Senator MALONE. Of course. The State Department is supposed to represent the President. But who is the President? A man who has a multitude of duties laid down in the Constitution. He does not know anything about the mining business. He does not know anything about the machine-tool- business. If one man—and I say this to you out of 30 years of experience—can become proficient in one little part of a business, he is lucky. He would not know anything about the other businesses of the world at all, except in general. So you have one man in the State Department or the President of the United States, who must take somebody's word for it. He can pull the economic rug from under any business in the United States almost overnight, and they have nothing to do with it. You are in favor of it. You have said it 20 times today.

Mr. PALEY. I take it for granted that when changes are made, they are made for good and sufficient reasons.

Senator MALONE. Who judges the reasons?

Mr. PALEY. I am also taking it for granted that the State Department is accountable to Congress for its actions.

Senator MALONE. They are not.

Mr. PALEY. You can require them to report to you.

Senator MALONE. You cannot call them up here and say, "Why did you do that." If they do not want to answer, they do not need to, or give you any reason.

Mr. PALEY. Do they not give a reason?

Senator MALONE. No, because it is not provided. They do not have to report to Congress at all. You want to continue that record?

Mr. PALEY. Sir, I have not had an opportunity to examine the abuses, if any, that occur under the authorization. All I can say is that if Congress is of a mind that these powers delegated to the executive branch are being abused, Congress certainly has the power to withdraw those powers.

FREE-TRADE THEORISTS

Senator MALONE. If they do not extend the act at the expiration at midnight on June 12, that will be done. Some of them are in favor of having it. But then they follow Henry Ford and Coleman and Winthrop Aldridge and Randall and Charlie Taft—I had him on the radio one night, all pushing for free trade.

Mr. PALEY. I hope it was over CBS, sir.

Senator MALONE. Maybe you yourself would like to debate it.

I would like to if I were invited.

Mr. PALEY. You shall be.

Senator MALONE. To keep on the serious side of it, those in the country who already have their plants in behind the sweatshop labor curtain, or are getting ready to put them there, are for this business. Others like du Pont and Monsanto Chemical, are not interested in putting plants abroad to sell there. They are for the protection of the American workingmen and investors. That is where your line of cleavage goes. It is a question of who has more influence in Congress, I suppose, or whether Cogress really understands what is happening to them.

Mr. PALEY. I am taking it for granted, Senator, that these men you just mentioned who are in favor of a course opposite of yours have honest motives.

Senator MALONE. Sure, it is to make money.

Mr. PALEY. It is for the best interests of the United States.

Senator MALONE. I am sure they do not understand the ultimate effect.

Mr. PALEY. On the other hand, as you represent your point of view today, I am sure there are people on the other side who think that is a wrong course to follow.

Senator MALONE. My idea of having you down here was to be sure that you believed what you wrote, and I am sure you do. You do not want any tariffs or any protection for any industry whatever, except by paying subsidies or in some manner trying to keep alive the production or the industries in this country that are vital to defense. That is your position.

Mr. PALEY. That was my opinion on materials production, and it was the unanimous opinion of the entire Commission. I might suggest to you that on the Commission were two men who have been in the mining business for many years. One of them in particular, Mr. Arthur Bunker, is president of the Climax Molybdenum Co., and a well-known individual in mining circles. It might be interesting for you to get his views.

Senator MALONE. I know what his views are. Both Mr. Bunker and Mr. Brown said the words they used did not mean agreement. I would say to you that the Climax Molybdenum Co. has a practical monopoly on the world's production.

Mr. PALEY. I think he is very knowledgable and has the best interests of the country at heart.

Senator MALONE. I am sure he does.

Mr. PALEY. I want to say one thing about the statements made in Denver. That had to do with that portion of the report about the possible use of buffer stocks. As pointed out, we made no recommendation that we enter into such arrangements. It was merely put forward as a suggestion that might be considered and tried out in 1 or 2 materials. Once again I want to say that I, too, have very serious misgivings about the desirability of introducing such arrangements.

EFFECT OF DUMPING LEAD AND ZINC ON THE DOMESTIC MARKET

Senator MALONE. I have already told you that this international stockpile idea with us furnishing the money worked to break the market on lead and zinc and other products. That has been established. There is no secret about it. England was furnished the money and bought large stocks of lead and zinc, and then sold them in this country at a much lower price early last year. Since that time there have been no reserves of zinc, as we have come to consider them. At 16 cents a pound, about the breakeven point, or 15 cents a pound, there was quite a considerable amount of reserves; but at 10 cents a pound there are no reserves. In other words, through the price control under the State Department's ability to manipulate it, they simply took away whatever reserves you had in this country.

Of course, the pumps are working now in some of the mines and most of them have shut down, and those that are operating are doing it mostly at a loss to save the property until they see what Congress is going to do, and then most of the rest of them will shut down.

I want to call your attention to page 90, volume I, where you take the position that under international arrangements multilateral agreements and buffer-stock agreeements, whether with or without quota agreements, are desirable.

Mr. PALEY. I have very serious doubt about the advisability of those. They were offered as some suggestions for taking care of this very important question of instability in the price of minerals, not only in this country, but throughout the world. My hope is that at least the discussion of the problem, and the suggestions put forward as to how the problem could be handled, might encourage creative discussion among members of the industry in particular, so that finally some adequate solution can be created.

Senator MALONE. One solution that we might arrive at on principle would be just to go in accordance with the Constitution of the United States. People in the Government who have no particular knowledge of the business might just quit trying to run it. There is quite a prevalent opinion in a good many areas to that effect.

On page 79 you make statements concerning the Buy American Act, and you advocate the abolition of this act. I suppose you know what that would do and you thought it out and you are in favor of abolishing any favored treatment to the American producer?

OPPOSED TO PRINCIPLES SPECIFIED IN THE "BUY AMERICAN ACT"

Mr. PALEY. Of course, the Buy American Act has been interpreted by the buyers of material for the Government for stockpile purposes to mean that they would favor domestic production as long as the difference was no more than 25 percent. In other words, they were paying up to 25 percent more for material in this country than they would have to pay for it if they had obtained it from outside sources.

Senator MALONE. That is correct. You are not in favor of that?

Mr. PALEY. I am not in favor of that.

Senator MALONE. You are in favor, I presume, of allotting contracts to foreign nations for the installation of equipment, such as generators and other electric equipment, and any machinery in this country, where the foreign nations could underbid us, are you?

Mr. PALEY. Once again I must say that I think my views on tariffs and on the advisability of freer trade have been very clearly pronounced here 2 or 3 times.

Senator MALONE. Yes; they have, but you are in favor of letting these bids wherever there is the lowest bid, regardless of any difference in the labor cost or operating cost or taxes or anything else?

Mr. PALEY. I am, up to the point where such purchases or such arrangement might affect our materials security position.

Senator MALONE. Some of us think our security was threatened there because you could not get the repairs in wartime. But if you piled up the repair parts here so you could get through a war, you would be in favor of it?

Mr. PALEY. Repairs?

Senator MALONE. The necessary repairs that might be necessary during a war to these generators and other electrical equipment at the dams.

Mr. PALEY. No; I think during a war period it would be important to have an industry in being capable of making specialized kinds of machinery.

Senator MALONE. How are you going to do that if you give a lot of bids to foreign nations?

Mr. PALEY. As I said before, if the time came when we thought this kind of competition was threatening the continuation of a strong industry, such as that which would be needed during a war period, I think we would have to treat it in such way as to insure the continuation of such businesses in being.

Senator MALONE. Government contractors in the United States are compelled to comply with the Walsh-Healey Act which establishes minimum wages for Government contractors. Minimum wages established under the Walsh-Healey Act may be far higher than those specified in the Fair Labor Standards Act. In fact, within wide limit they might be set at any point which the Secretary of Labor finds proper. If this act is continued and the Buy American Act is repealed, American contractors are at a serious disadvantage in competing with foreign bidders. Do you still take the same attitude that the low bid must be accepted unless it really endangers security?

Mr. PALEY. Yes, sir. I want to make one more remark: In many of these cases, by buying materials in other countries, we give them the opportunity to increase their trade. We will be serving ourselves

better and serving them better than by following the former course, namely, making very large and substantial grants to them.

Senator MALONE. Do you take it for granted that we have the habit of grants, and that you have to continue the grants unless you divide the basis of your income here with foreign nations?

Mr. PALEY. No, sir, but I think it has been the policy of our Government for a long time to want to keep our allies as strong as they can be both militarily and economically.

Senator MALONE. What would you think of a quid pro quo arrangement so if they wanted to buy anything from this country, we would just take credit in their currency at the current rate of world exchange, and ignore entirely what they said their money was worth, and then when we wanted to buy something from their country, let them debit us at the current rate of exchange? Do you think that would have any earmarks of good business?

Mr. PALEY. It depends on what the outcome would be as to balances, sir. I am not sure whether or not you are talking about the advisability of free convertibility of currency.

Senator MALONE. There would be no balance or imbalance because they would owe us in pounds until we took it out in trade. We would not demand the gold in turn. When we buy gold from South Africa, if they owe us a million pounds at $2.60 or whatever the current pound was on the market at that time, they would debit us in pounds sterling at the current rate of exchange.

Mr. PALEY. And just let them develop a very large debt position against us over a period of years?

Senator MALONE. How do you mean?

Mr. PALEY. If the thing does not balance out, eventually, they would be owing us an awful lot of money.

Senator MALONE. What does a bank do to you when you borrow money? There is a limit to how much you can borrow.

Mr. PALEY. That is right.

Senator MALONE. To protect your earning power and keep your family at the standard of living they are accustomed to, you pay the money back in a reasonable time.

Mr. PALEY. That is right.

Senator MALONE. Would not that be the right way to treat the foreign nation and treat our own taxpayers with a little consideration at the same time? Maybe there would be a limit to how much you would allow them to buy.

Mr. PALEY. That is the way it works out now. They cannot buy except through the acquisition of dollars.

Senator MALONE. Yes, you give them the money and write it off.

Mr. PALEY. We certainly give them the money. I said a few minutes ago I hope they can earn the money.

Senator MALONE. Let them earn the money by producing the goods and debiting us in the amount of pounds that we have already a credit for.

Mr. PALEY. That is what I am advocating. I am advocating that if they do produce the materials we can use, and if they can produce it at a cheaper price than we can, we ought to take it rather than give the money—for which we get nothing.

Senator MALONE. But you do not have to give them money. That is where you make the wrong assumption. It is like someone on the

corner you give a dollar to every time you pass, but if you do not have a dollar, you do not have to borrow it to give it to him.

Mr. PALEY. At the same time you have to have some concern about the economic standing of our allies.

Senator MALONE. What is your military position today?

Mr. PALEY. I think we are in a great danger of finding ourselves at some time in the future in a shooting war against Russia.

Senator MALONE. Do you think we can do anything with the foot army we have in Europe?

Mr. PALEY. We are getting into a different area. All I say is that, in those considerations, I think we have to be concerned about the economic strength of our allies.

Senator MALONE. In other words, support all of our allies even to dividing our markets with them. Would you know that we never had four and a half to five and a half percent of our total income from foreign trade except when we started to appropriate money and give it to them and count that as trade. Also, when we manufacture goods and send them to them as war material we count that as trade. We have been doing that. That ran it up to 10 or 12 percent. I developed a table at one time that is in the Congressional Record. You subtract each year from the amount of what we call trade the amount of money you gave them that year, and the amount of goods you sent them free, and you come right back to less than four and a half to five and a half percent of your national income. So what you are doing is like the man with a grocery store whose business falls off so he goes to a bank and gets money and scatters it around the neighborhood and hopes he gets it back.

Mr. PALEY. That will not last.

Senator MALONE. What is the difference between the unbusinesslike practices of a man in business and the unbusinesslike practices of a nation? A man by himself is done when his bank quits him. As soon as they find out what he is doing, they will quit him soon enough. But here we are not finished as a government until the money we print has no value. And that is where we are heading.

Mr. PALEY. What I am saying, Senator, is that if we do not intend to continue foreign aid as we have in the past, and we do have some consideration for the economic health of these nations, we ought to encourage them to build up their economic structure.

Senator MALONE. I have your point entirely. You think it is better to divide the source of our income rather than give them our income. When you divide the markets, that is the source of our income. It is like a man who has to give $1,000 to the Red Cross. He growls a little, but if he has it, he gives it to them. But if he is a lawyer, and they say, "We want a third of your clients," he has no income. That is what they are doing today. You are dividing the source of your income, and you think that is going to work out all right.

Mr. PALEY. I do not come to the same conclusion.

Senator MALONE. I know you do not. We are very happy to have you here. We have done exactly what we intended to do. We clarified these paragraphs, and it is very clear what you think about the foreign trade situation and how we ought to handle the production in this country. I think I can sum it up in a very short paragraph, that anything that does not have to do with the national defense, or at least

where we are reasonably sure we can get it in wartime, you want to get it where you can get it the cheapest, regardless of wages, taxes, or operating expenses in any manner whatsoever.

Mr. PALEY. By and large I would say that is a pretty good summary of my position on raw materials with some exceptions.

Senator MALONE. And then you would go to these communities that are laid waste on account of it, which have built schools, roads, and all these things, and the Government would owe them something in compensation and as the State Department often said, train them for new work and maybe pay their transportation to some other area, but they would clear out of that area unless it was a national-defense industry.

Mr. PALEY. I would say this. I think this concern of Government should apply not only to those communities, industries, or bodies of labor, which are affected by the lowering or the elimination of tariffs. I think the Government should be concerned if they find themselves in that condition for other reasons.

Senator MALONE. But whenever the Government destroys their livelihood through removing the tariffs or import fees that they went into business under, you think they ought to train them for new work and pay their fare to another area and in some way compensate them for the loss of that industry?

Mr. PALEY. I am not sure what form it should take, but I think the Government should in distress cases have an interest in trying to convert the capital which is involved, and the labor which is involved, into something else, so that the capital can be employed again fully, and so that the workers have employment.

Senator MALONE. I think I understand it perfectly and I think it will be very clear in the record, that the man at the top, the Secretary of State, in this business, on consultation no doubt with the President, but not with the Congress, should be able to remake the industrial map of this country which he has already done for the last 20 years, and to continue to remake it on what he considers and the President considers in the national good.

Mr. PALEY. Of course, these dislocations have taken place before and not for reasons of tariff.

Senator MALONE. They have not taken place suddenly.

Mr. PALEY. That is true to a certain extent. Technological improvements at times will take out a whole industry.

DEFICIT SPENDING

Senator MALONE. Certainly, and nobody pays any attention to it. But what you have done is to destroy an industry overnight when you make one of these trades. But you have held it up for 20 years with 2 wars, with PWA and WPA by assessing the taxpayers, and sending the money abroad with part of it coming back to purchase your materials. You had a $20 billion debt when Mr. Roosevelt took over. You have a $275 billion debt now. It has cost you $255 billion in 22 years to maintain some kind of prosperity under the system you have adopted. Like it or not, that is the way it is.

Mr. PALEY. I do not think the system is responsible for all that. Do not forget we have had two wars.

Senator MALONE. That is right, and they kept us out of unemployment.

Mr. PALEY. They certainly helped.

Senator MALONE. I do not know how many hundreds of thousands of boys we now have all over the world, which cost $10,000 a year apiece, and they are spending that money in those areas in lieu of the Marshall plan. I was one of the two men that fought off the raise in the national debt limit last year, and unless I am convinced that a war is imminent this time, I am going to help fight it off again, because we have lost control of the appropriations in Congress. We do not know how much money we appropriate until somebody adds it up, the only protection we have is to fix it so you cannot sell the bonds, and if you cannot do that, we better start living within our income at some time, do you not think so?

Mr. PALEY. I am not a financial expert, but I think somebody has to be concerned with any sort of debt.

Senator MALONE. Do you not think if we raised the debt limit and we went up to $290 or $325 billion, and they started to put the money in circulation, it would continue the inflation?

Mr. PALEY. I certainly think runaway inflation is a very dangerous thing, and I hope that nothing is done through our fiscal policy management to have this country in a runaway inflationary period.

Senator MALONE. Do you not think that would start another?

Mr. PALEY. With the kind of damaging effect I have in mind. I do not know enough about high finance to give you an opinion.

Senator MALONE. Nobody else does either. The dollar is 40 cents now, or what would you say it is?

Mr. PALEY. I would say 50 percent.

Senator MALONE. There is some difference of opinion. Some say 30 percent and some 50. But you have priced yourself out of every market in the world. If your theories prevail, we are priced out of our own market.

Mr. PALEY. I can say one closing thing, that in spite of everything that was brought up here, I have every confidence that this country is going to forge ahead and be more prosperous, and we will have a healthier economy, and we will improve its military position. In other words, I have the highest degree of confidence about the future in this country.

Senator MALONE. So do I, but I think we will change these principles you have recommended.

(By direction of the chairman, the staff study referred to in this hearing is made an appendix.

(Whereupon at 5:40 p. m. a recess was taken subject to the call of the Chair.)

APPENDIX

MINERALS, MATERIALS, AND FUELS ECONOMICS SUBCOMMITTEE

STAFF STUDY

PALEY COMMISSION REPORT

39888—54—pt. 8——8

FOREWORD

President Truman addressed a letter to the Speaker of the House of Representatives on July 1, 1952, transmitting to the Congress the report of the President's Materials Policy Commission, Resources for Freedom. He advised the Congress that he was requesting various governmental agencies to make a detailed study of the many recommendations, and that he was directing the National Security Resources Board to assume the responsibility of coordinating the findings and of maintaining a continuing review of materials policies and programs as a guide to public policy and private endeavor. His letter implied that legislation would be presented to implement the Commission's recommendations.

On December 10, 1952, Mr. Jack Gorrie, the Chairman of the National Security Resources Board, submitted a report in compliance with the President's request reviewing the President's Materials Policy Commission report from the standpoint of the National Security Resources Board and making recommendations for the implementation of portions of the PMPC report with which it concurred.

If many of these recommendations are enacted into law, they would have an adverse effect on our economy. Thus, it is appropriate to review the Commission's report and the report of the NSRB in detail. How was the PMPC report prepared, who wrote it, and what does it really contain? This review attempts to answer these questions.

HOW THIS REPORT WAS PREPARED

Page 175 of volume I shows that the Commission was created to carry out functions which had been visualized for it by the Chairman of the National Security Resources Board.

The Commission obviously was forced to depend upon its staff for the collection of information, the preparation of statistical analysis, long-range projections, and suggested conclusions. In fact, the Commission itself says:

"Organization of the PMPC staff foreshadowed the structure of the final report. An economic analysis group undertook to project estimates on economic needs and materials supply into the future and to study the past and present role of materials in national economies. Others sought out the significant facts about domestic resources, foreign resources, energy resources, the potential of technology, and the problems of security and market policy. A legal staff made a detailed scrutiny of laws bearing on materials problems, and a statistical services staff amassed tables and estimates on growth of populations, production, trade, and investment rates, tariffs and other duties, tax rates, and price movements. A commodity panel undertook a series of studies on a score or more of specific materials.

"Early in the studies, the staff dealing with foreign resources alone had scheduled over a hundred research projects deemed necessary or desirable. The list of studies in this and other fields had to be placed in expert hands in Government and international agencies, in industry, and in universities to provide a rich background of fact and analysis for the Commission's deliberations."

The staff apparently is responsible for much of the work of volumes I, II, and III. Volumes IV and V are departures from most of the other volumes in that the majority of the chapters are signed by their respective authors. Many of the authors of volume IV are associated with organizations of demonstrated competence in the minerals field. For example, the Commission says:

"A panel formed by the National Research Council reported on the possibilities of improved discovery techniques in the minerals field. The Battelle Memorial Institute carried out 41 studies on the role of technology in many minerals and metals. Koppers Co., Universal Oil Products, and Standard Oil Development Co. contributed comprehensive studies on the technology of extracting chemicals and other materials from coal, petroleum, and gas. Arthus D. Little Co., Inc., carried out a comphehensive study of the use of materials in the con-

struction industry; the American Standards Association undertook research into possible materials savings through greater standardization."

The Commission also states that it had numerous conferences and meetings with representatives from industry, universities, and foundation. Page 176 of volume I lists a number of those with whom the Commission conferred. The Commission does not indicate, however, what contribution was made by any of the individuals listed, or whether in fact any of their suggestions were incorporated in the final report.

It is obvious that the major portion of this work was performed by the staff and it is thus pertinent to review their backgrounds and qualifications in some detail.

PERSONNEL—THE COMMISSION

The Commission, appointed by the President, consisted of five individuals: William S. Paley, Chairman; George R. Brown, Arthur H. Bunker, Eric Hodgins, and Edward S. Mason.

Two of these individuals, George R. Brown and Arthur H. Bunker, have had extensive experience in the mineral industry and have the technical background to deal with the problems before this Commission. A summary of their biographies, as they appear in the 1952–53 Who's Who in America, follows:

George R. Brown

Business executive and engineer. Born: May 12, 1898, Belton, Tex. Education: Student, Rice Institute, 1916–18; E. M., Colorado School of Mines, 1922. Business Student, Rice Institute, 1916–18; E. M., Colorado School of Mines, 1922. Business: Began as mucker and sampler Anaconda Copper Co., 1922; member firm Brown & Root, engineering constructors, 1923–29; executive vice president Brown & Root, Inc., since 1929; president Brown Engineering Corp.; chairman of board of Texas Eastern Transmission Corp; director First National Bank of Houston, International Telephone & Telegraph Corp., Southland Paper Mills. Vice chairman of the board of trustees William M. Rice Institute. Member: American Institute Mining and Metallurgical Engineers; National Society Professional Engineers; Texas Society Professional Engineers; and American Society Civil Engineers.

Arthur H. Bunker

Business executive. Education: Yale (Sheffield Scientific School), 1916. Business: Director American Metal Co., Ltd., Firth Sterling Steel & Carbide Corp.; president and director of Climax Molybdenum Co.

The remaining three members of the Commission have no experience in the mineral field. A summary of the biographies of these Commissioners follows:

William S. Paley, Chairman

Chairman board Columbia Broadcasting System, Inc. Born: September 28, 1901. Chicago, Ill. Education: Graduated, Western Military Academy, Alton, Ill., 1918; student, University of Chicago, 1918–19; B. S., University of Pennsylvania, 1922. Business: With Congress Cigar Co., Philadelphia, Pa., in charge production and advertising, 1922–29, vice president, 1923–29, also secretary, 1925–29; president Columbia Broadcasting System, Inc., 1928–46, chairman board since January 1946; director Columbia Records, Inc.; trustee United Hospital Fund of New York; director Museum Modern Art; director Philharmonic-Symphony Society of New York. With Office of War Information 1943, Chief of Radio of the Psychological Warfare Division of SHAEF., 1945.

Eric Hodgins

Editor and author. Born: March 2, 1899, Detroit, Mich. Education: S. B., Massachusetts Institute Technology, 1922; student, Harvard Graduate School, 1923–24; Litt. D., Bates College, 1939. Business: Managing editor Technology Review, Massachusetts Institute Technology publication, 1922–27, assistant to the president, 1926–27; department editor the Youth's Companion, 1927–28, managing editor, 1928–29, editor 1929; advertising department McCall Co., 1929–32, promotion manager, 1932–33; associate editor Redbook, 1933–34, associate editor Fortune, 1934–35, managing editor, 1935–37, publisher 1937–41; vice president Time, Inc., since 1938, editorial vice president (in charge public relations) 1941–46; resigned 1946 to resume writing as member board of editors, Fortune. Author: Mr. Blandings Builds His Dream House, 1946; earlier writings (with F. A. Magoun) Sky High, 1929 (revised and enlarged edition, 1935); A History of Aircraft, 1931; Behemoth, 1932.

Edward S. Mason

Professor economics, Harvard University. Born: February 22, 1899, Clinton, Iowa. Education: A. B., University of Kansas, 1919; A. M., Harvard University, 1920; B. Litt., Oxford University, England, 1923; Ph. D., Harvard University Graduate School, 1925; Litt. D. (hon.), Williams College, 1948. Business: Engaged as instructor economics, Harvard University, 1923–27, assistant professor economics, 1927–32, associate professor economics, 1932–37, professor same since 1937, dean Graduate School Public Administration, since 1947; economic consultant to Department of Labor, 1938–39, Defense Commission, 1940–41; Office of Strategic Services, Washington, D. C., 1941–45; Deputy to Assistant Secretary of State in Charge Economic Affairs, 1945; economic consultant to State Department, 1946–47; chief economic adviser at Moscow Conference, 1947; appointed by President Truman as member advising committee on management improvement to assist in improving governmental organization. Member: Council of Foreign Relations; American Economic Association; and Royal Economic Society of London.

The staff, listed in volume I consisted of 119 people; 72 members of the staff are not listed as belonging to any major professional organization which would indicate any special competence to deal with the problems of the mineral industries. Their names are listed below:

Executive staff:
- Coombs, Philip H.
- Page, Norvell W.

Domestic resources:
- Barnes, Jack R.
- Black, Robert B.
- Bonnen, James T.
- DeVeau, J. Harold
- Edelstein, Harry M.
- Maass, Arthur A.
- Mason, Bayley F.
- Rettie, James C.

Foreign resources:
- Belcher, Marjorie
- Brewster, Kingman, Jr.
- Kahn, Harry, Jr.
- Lipkowitz, Samuel
- Nichols, Calvin J.
- Parks, Wallace J.
- Tatistcheff, Alexis B.

Energy resources:
- Browne, E. Wayles, Jr.
- Dwyer, Cornelius J.
- Godaire, John G.
- Guyol, Dorothy E.
- Jones, Herschel F.
- McMaster, William J.

Techonolgy:
- Cabot, Robert M.
- Clark, Frances H.
- Kelston, Leon
- Miller, Ruth
- Stoddard, Eleanor H.
- Stone, Peter A.

Security and market policy:
- Knorr, Klaus E.
- Mazzocco, William J.
- Teets, Harry

Commodity studies:
- Alexander, Sidney S.
- Cleveland, Alfred S.
- Cosman, Cornelius
- Kuh, Edwin

Commodity studies—Continued
- Lehmann, Glenn A.
- Lion, Donor M.
- Lusher, David W.
- McGann, Paul W.
- Neischert, Bruce C.
- Parker, William N.

Staff consultants:
- Harberger, Arnold C.

Editorial staff:
- Beachy, Elizabeth J.
- Cohen, Hymen E.
- Farrar, Elizabeth
- Jacques, Phillippe G.
- Jarrett, Henry
- McConnell, Margaret
- Petruccelli, Antonio
- Schirf, Marietta
- White, Connie Burwell
- Woods, Jane A.
- Zuber, T. Osborn

Legal:
- Martz, Clyde O.
- Morrisson, James L.
- Schifter, Richard
- Williams, Howard R.

Statistics:
- Andrews, Newton S.
- Craig, Mary B.
- Foreman, Jerry G.
- Horn, Jason
- Moon, Roy
- Schaperow, Elaine R.
- Whiting, Wilhelmina F.
- Zucker, Jack I.

Administrative:
- Bredenberg, Harry T.
- Carter, Mary M.
- Mills, Eleanor M.
- O'Neill, Helen L.
- Pontius, Harry E.

Dr. Arnold C. Harberger of Johns Hopkins University played a very prominent part in the preparation of the projections upon which this study is based. The reason he apparently is not listed is that he was born in 1924 and is only 30 years of age at the present time.

Forty-seven members' names are found in professional directories, and their biographies follow.

EXECUTIVE STAFF

Ackerman, William C., executive secretary: Listed in American Men of Science; graduated from University of Wisconsin, B. S., 1935; with TVA since 1935.

Isenbergh, Max, general counsel: Lawyer; Chief, Appeal and Legislation Branch, Office of Alien Property, Department of Justice. Born: Albany, N. Y., August 28, 1913. Education: B. A., Cornell University 1935; LL. B., Harvard 1938; LL. M., Harvard 1939; M. A., Harvard 1942. Professional record: Admitted to bar, New York, Supreme Court of United States; employment assistant counsel, Senate Committee on Interstate Commerce, 1938; graduate fellow, Harvard Law School, 1938–39; tutor, University of Chicago Law School, 1939–40; attorney, Securities and Exchange Commission, 1940–41; law clerk to Mr. Justice Black, United States Supreme Court, 1941–42; attorney, War Shipping Administration, 1942–43; special assistant to Attorney General, Department of Justice, 1943 to present; Chief, Appeals and Legislation Branch, Office of Alien Property, Department of Justice, at present. Membership: Trustee, Arlington Civic Symphony; Phi Beta Kappa. United States delegate to preliminary conference in London on German trade-marks. In charge of Government case in *Standard Oil* v. *Clark*. Member of interdepartmental committee on cartels. Publications: Author of several legal articles in law reviews; former editor, Harvard Law Review. (Source: American Men in Government.)

DOMESTIC RESOURCES

Ball, Howard E.: An H. E. Ball is listed in the membership of the American Institute of Electrical Engineers from Cleveland, Ohio.

Barnett, Harold: Member of American Economic Review since 1946. Assistant Chief, State Department Division of German and Austrian Economic Affairs.

Carmody, John M.: Chief Engineer, Civil Works Administration and Federal Emergency Relief Administration. Member, National Mediation Board, November 1933 to September 1935; member, National Labor Relations Board, September 1935 to September 1936; administrator, Rural and Electrification Administration, 1936–39; member, President's Power Policy Committee, 1936–41; chairman 1931–41, including administration, Lanham Act defense housing program, 1940–41; member, Maritime Commission, 1941–46; chairman, Maritime War Emergency Board, 1946–47; chairman, Federal Interdepartmental Safety Council, 1946–47; member, General Review Board, War Assets Administration, 1947–48; life member, Society for Advancement of Management; member, National Academy of Arbitrators, Industrial Relations Research Association; director, National Popular Government League, Public Affairs Institute; past president of Society of Industrial Engineers.

Cherington, Charles R.: Member of American Economic Association since 1939.

Fritz, Wilbert G.: Member of American Economic Review since 1930. Listed in directory of membership of American Statistical Association as fiscal economist, Division of Fiscal Analysis, Bureau of the Budget.

Herfindahl, Orris C.: Member of American Economic Association since 1947. Instructor, University of Illinois.

Kube, Harold D.: Member of American Economic Association since 1940. Cambridge Group (on leave of absence from Department of Commerce, Bureau of Census). Coauthor, Changes in Distribution of Manufacturing Wage Earners, 1899–1939.

Matthews, Allen F.: Listed in the Directory of the American Institute of Mining and Metallurgical Engineers. Editor, Minerals Yearbook, United States Bureau of Mines.

Nelson, James R.: Subscribing Member of American Economic Association since 1947.

Nixon, John H.: Junior member of American Economic Association since 1943. Student, Harvard University.

Oakes, Eugene E.: Member of American Economic Association since 1931. Economist, Joint Committee on Internal Revenue Taxation. Lecturer, Georgetown University. Published: Federal Offset and American Death Tax System (QJE August 1940); Incidence of General Income Tax (AER March 1942); Taxation of Pensions and Annuities (JT Commission on Internal Revenue Taxation, 1946). Listed in Directory of American Scholars. Born: Milwaukee, Wis., November 29, 1909. Graduated: Northwestern, B. S. 1931; Harvard,

A. M. 1933, Ph. D. 1934. Instructor of economics and tutor in division of history, government, and economics, Harvard, 1934–38. Instructor of economics at Radcliffe College, 1936–38. Assistant professor, Yale, 1938.

Schurr, Sam: Member of American Economic Association since 1947. Research associate, assistant professor, and research editor, Cowles Committee for Research in Economics, University of Chicago. Published: Mining Industries, 1899–1939; Study of Output, Employment and Productivity (with H. Burger) (National Bureau of Economic Research 1944); Economic Aspects of Atomic Energy as Source of Power (AER, May 1947).

FOREIGN RESOURCES

Feis, Herbert: Economist. Member of American Economic Association since 1921. Published: Europe the World's Banker, 1870–1914 (1931); Sinews of Peace (1944); The Spanish Story (1948). Instructor of economics, Harvard, 1920–21; associate professor, University of Kansas, 1922–25; professor of economics and head, Department of Economics, University of Cincinnati, 1926–29; member of staff, Council on Foreign Relations, 1930–31; economic adviser, Department of State, 1931; adviser, international economic affairs, 1937–43; special consultant to Secretary of War, 1944–46; chief technical adviser, American delegation, World Economic and Monetary Conference, London 1933; special adviser, Conference of American Republics, Buenos Aires, 1936, Lima, Peru, 1938, Panama, 1939; adviser on American industrial relations, International Labor Office, League of Nations, various periods, 1922–27; member, Institute for Advanced Study, Princeton, since 1948. Author: Settlement of Wage Disputes (1922); Principles of Wage Settlement (1926); The Changing Pattern of International Economic Affairs (1940). Listed in Directory of American Scholars. Born: New York, N. Y., June 7, 1893. Graduated: Harvard, A. B. 1916, Ph. D. 1921.

Frank, Isaiah: Member of American Economic Association since 1945. Chief, United States Department of State, Special Areas Section, Internal Resources Division. Published: British Share Prices, 1790–1850; Review of Economic Statistics, May 1940; American Policy Concerning German Monopolies, Department of State Bulletin, May 11, 1947.

Mikesell, Raymond F.: Member of American Economic Association since 1936. Professor of economics, University of Virginia. State Department consultant. Published: Role of International Monetary Agreements in a World of Planned Economics (JPE, December 1947); ILO Charter (AER, June 1947); Regional Multilateral Payments Arrangements (QJE, August 1948).

Spiegel, Henry W.: Member of the American Economic Association since 1938. Associate professor, Catholic University of America. Published: Economics of Total War (1942); Brazilian Economy: Chronic Inflation and Sporadic Industrialization (1948).

ENERGY RESOURCES

Blum, Robert: Member of American Economic Association since 1947. Listed in Directory of American Chemical Society as a junior member.

McDermott, Mary E.: Member of American Economic Association since 1942. Research assistant in economics, Atlantic Refining Co. Born in 1905. Received A. B. in petroleum economics at Dickinson College.

Putnam, Palmer: Scientist. Explored volcanoes in Central America, 1922; geologist to Belgian Congo, 1926–27; president and chairman of board, G. P. Putnam's Sons, 1930–32; research work on wind turbine, 1935–41; director, Putnam Oceanographic Expedition; technical aide, National Defense Research Committee, 1941; developed the Duck, the Weasel, and other weapons, 1941–43; developed tactics of amphibians assault, on mission for Joint Chiefs of Staff to various theaters of war, 1943; on loan to and on missions for Admiral Mountbatten, 1943–44; special assistant to Director, Office of Scientific Research and Development, 1944–45; director, chief consultant of Windpower, Inc., 1946; chief consultant, American Railway Conductor's Institute, 1946; special adviser to the Atomic Energy Commission, 1949. Author: Power From the Winds.

Sanderson, Fred H.: Member of the American Economic Association since 1944. Listed in directory of membership of American Statistical Association; chief, Western European Economic Branch, Division of Research for Europe, United States Department of State.

Widgery, Rolande C.: Listed in directory of American Chemical Society. Employed by Gulf Research & Development Co., Pittsburgh.

TECHNOLOGY

Brozen, Yale: Economist. Member of American Economic Association since 1941. Northwestern University professor. Published: Workbook for Economics (1948); textbook for Economics (1948); Optimum Capital Use and Technological Change. Assistant professor, social science, University of Florida, 1940–41; assistant professor of economics, Illinois Institute of Technology, 1941–44, associate professor, 1944–46; associate professor of economics, University of Minnesota, 1946–47; visiting professor of economics, 1948; professor of economics, Northwestern University, Evanston, Ill., since 1947. Civilian Training Administrator, Signal Corps, United States Army, 1942–43.

Elias, Nathaniel M.: Listed in American Men in Science. Born: New York, N. Y., February 21, 1895. Educated: Columbia, B. S., 1915. Research chemist: Thomas A. Edison, 1915–16; Edison Storage Battery Co., 1916–17. Research and development of intermediates and dyes, E. I. du Pont de Nemours and Co., 1917–21. Chief chemist: Tower Manufacturing Co., 1921–22; Fletcher Chemical Co., 1922–23. Consulting chemist and private research, 1923 to present. With: Board of Economic Welfare, 1943; North African Economic Board, 1943; Foreign Economic Administration, 1944; Technical Industrial Intelligence, 1945; Reparations Commission, 1946. Chemical consultant, NSA, 1947. Member: Chemical Society; Institute of Mining and Metallurgical Engineers; Institute of Electrical Engineers; Chemists Club. Also listed in directory of American Chemical Society, Institute of Electrical Engineers, and American Association for the Advancement of Science.

Tyler, Chaplin: Listed in American Men in Science. E. I. du Pont de Nemours & Co., Wilmington, Del. Born: Washington, D. C., March 28, 1898. Educated: Northeastern University, B. Ch. E., 1920; Boston University, B. B. A., 1922; Massachusetts Institute of Technology, S. M., 1923. Business: Assistant applied chemistry, Massachusetts Institute of Technology, 1920–22; Research associate, 1923–24; assistant editor Chemical and Metallurgical Engineering, 1924–27; chemist, E. I. du Pont de Nemours & Co., 1927–35; assistant director, 1935–41, member of development department, 1942; associate in journalism, Columbia, 1926–27; special lecturer, Delaware, 1946; United States Army, 1917–19. Member: Chemical Society; Institute of Chemical Engineers; Compressed Gas Association. Also listed in Who's Who in Engineering and directory of American Chemical Society.

Williams, Roger, Jr.: Listed in American Men in Science. With McGraw-Hill Publishing Co. Born: Wilmington, Del., February 19, 1920. Educated: Amherst College, B. A., 1941. Business: Cost engineer, ammonia department, E. I. du Pont de Nemours & Co., West Virginia, 1941–46; research staff plastics department, E. I. du Pont de Nemours & Co., Delaware, 1946–47; assistant editor, Chemical Engineering, McGraw-Hill Publishing Co., 1948 to present. Member: Chemical Society; Institute of Chemical Engineering; Physical Society; Mathematical Society; Society of Plastics Industry. Also listed in director of American Chemical Society as junior member, and American Association for the Advancement of Science.

SECURITY AND MARKET POLICY

Ames, Edward: Edward W. Ames, consulting geologist, listed in membership directory of the American Institute of Mining and Metallurgical Engineers. Engineer, United States Bureau of Mines, Denver; member of American Association for the Advancement of Science.

Gideonse, Max: Member, American Economic Association since 1930. Professor of Economics, Rutgers University. Published: Les Accords Commerciaux Reciprogures it l'Administration Roosevelt (Rev. Economique Internationale, August 1936); Foreign Trade and Commercial Policy Since 1860 (in Growth of American Economy) (1944); United States Foreign Trade Policy (Rev. of New Jersey Business, January 1948). Listed in Directory of American Scholars. Born: Rotterdam, Netherlands, April 24, 1904. Graduated: University of Rochester, A. B. 1925, A. M. 1926; Harvard, Ph. D. 1932. Assistant professor, Rochester, 1925–26; Harvard, 1927–29; assistant professor of economics, Rutgers, 1930–40, associate professor, 1940. Member: Economic Association; Economic History Association; Academy of Political Science.

Hunsberger, Warren S.: Member of American Economic Association since 1935. Chief of Far East, Division of Research, Japan Branch, Department of State. Published: Japan's Position on International Payments, June 1938; The Yen Bloc in Japan's Expansion Program, November 1938; Far Eastern

Survey; Japan: Government Finance. Listed in directory of American Scholars. Born: Philadelphia, Pa., August 28, 1911. Graduated: Yale, A. B. 1933; Ph. D. 1937. Instructor of economics, Albertus Magnus College, 1934–37; instructor, Sheffield Science School, Yale, 1935–36; instructor, Princeton, 1937–40; assistant professor, University of New Hampshire, 1940; lecturer, Rutgers, 1939–40; economist, O'Ryan Study Mission, Japan and China, 1940. Office of Administrator Export Control, 1941.

Mendershausen, Horst: Member of American Economic Association since 1943. Professor of Bennington College. Published: Economics of War (Prentice-Hall, 1941, 1943); Changes in Income Distribution During the Great Depression (National Bureau of Economic Research, 1946).

Phillips, William T.: Member of American Economic Association since 1941.

COMMODITY STUDIES

Abrahamson, Albert: Listed in directory of membership of American Statistical Association. Professor of Economics, Bowdoin College.

Fisher, Frank L.: Founder and manager of the Harris & Ewing News Photograph Service, Washington, D. C., 1910–15; chief of illustrations division, National Geographic, 1915 to present. Served as lieutenant commander, United States Navy. Member: United States Naval Institute; National Geographic Society; Photographic Society of America; White House News Photographers Association; Resident Officers Association of United States Clubs.

Moment, Samuel: Listed in directory of membership of American Statistical Association.

Payne, W. Scott: W. Scott Payne, Jr., listed in directory of membership of American Statistical Association. Economist, Department of Commerce.

Wilcox, Clair: Listed in Directory of American Scholars. Born: Cuba, N. Y., January 29, 1898. Graduated: University of Pennsylvania, B. S., 1919; Ph. D., 1927; Ohio State, A. M., 1922. Instructor of economics, Lafayette College, 1919–20; assistant professor, Ohio Wesleyan, 1920–23; instructor, University of Pennsylvania, 1923–27; assistant professor, Swarthmore College, 1927–29; associate professor, 1929–31; professor, 1931; secretary, State parole commission, Pennsylvania, 1926–27; director of research, National Commission for Law Observance and Enforcement, 1930–31; special adviser, Consumers' Advisory Board, National Recovery Administration, 1934–35; consulting economist, Social Security Board, 1936; economic expert, Temporary National Economic Committee, 1939–40. Member: American Economic Association.

STAFF CONSULTANTS

Black, John D.: Member of American Economic Association since 1919. Member: American Farm Economics Association, American Statistical Association, Phi Beta Kappa, Alpha Zeta, Alpha Gamma Pho, Planning Association, Population Association, Royal Agricultural Academy of Sweden. Author: Introduction to Production Economics, 1926; Agricultural Reform in United States, 1929; Production Organization, 1929; The Dairy Industry and the AAA, 1935; Parity, Parity, Parity, 1942; Food Enough, 1943; World Needs for United States Food and Fiber, 1944; A Food and Nutrition Program for the Nation, 1945. Joint author: Farm Management, 1947; Three Years of the AAA, 1937; Agricultural Index Numbers, 1938; The War and American Agriculture, 1944; Future Food and Agriculture Policy, 1948; Sugar: Production on Import, 1947; Federal, State, and Local Relations in Agriculture, 1949. Editor of Social Science Research Council series on scope and method of research in agriculture economics and rural sociology, Nutrition and Food Supply: The War and After, 1943. Teacher in high school in Rice Lake, Wis., 1905–07; instructor of rhetoric at Western Reserve, 1910–11; instructor at Michigan College of Mines, 1911–13; assistant professor, 1913–15; instructor of economics, University of Wisconsin, 1917–18; professor of agricultural economics, University of Minnesota, 1918–21; chief of division, 1921–27; professor of economics, Harvard, since 1927; consulting specialist, Bureau of Agricultural Economics, United States Department of Agriculture, 1922; Chairman, Advisory Commission on Agriculture, Social Science Research Council, 1930–33; Chief Economist, Federal Farm Board, 1931–32; lecturer (summers), Iowa State College, 1935, and University of Kentucky, 1939; consulting economist, United States Department of Agriculture, 1937–40; War Food Administration, 1943; Tennessee Valley Authority, since 1940. Listed in membership directory of American Statistical Association, American Men of Science, and director of American Scholars. Born: Cambridge, Wis., January 6,

1883. Graduated: Wisconsin State Normal School, 1905; University of Wisconsin, A. B., 1909; A. M., 1910; Ph. D., 1918.

Bateman, Alan M.: Geologist. Assistant geologist, German Development Co. of Canada, 1906–09; associate geologist, Canadian Geological Survey, 1910–12; instructor, Yale, 1913; field geologist, secondary enrichment investigation, Harvard University, 1913–15; assistant professor of geology, 1916–21; associate professor, 1922–25; professor of economic geology, Yale, 1925–present; consulting geologist to Kennecott Copper Corp since 1916; head of special United States mission to Mexico, 1942; Director, Metals and Minerals, Foreign Economic Administration, Washington, D. C., 1942–46; editor in chief, Journal of Economic Geology; former editor, American Journal of Science; now chairman of board of managers. Member: American Institute of Mining Engineers; Institute of Mining and Metallurgy; Geological Society of America; Society of Economic Geologists, American Association of Petroleum Geologists; Washington Academy of Arts and Sciences; Mining and Metallurgical Society of America; American Institute of Mining and Metallurgical Engineers; American Academy of Arts and Sciences; honorable member, Society of Mining and Geology, Chile. Author: Economic Mineral Deposits; writer of papers on origin of mineral deposits. Listed in American Men in Science. Born: Kingston, Ontario, January 6, 1899, naturalized 1916. Graduated: Queen (Canada), B. A., B. S., 1910; Yale, Ph. D., 1913. Also listed in Who's Who in Engineering, and directory of the American Mining and Metallurgical Society of America.

Chase, Fred M.: Listed in American Men in Science. Born: Swansea, Mass., August 24, 1906. Education: Brown, Ph. B. 1929, M. A. 1932; Massachusetts Institute of Technology, 1933; Harvard, 1933, A. M. 1937, Ph. D. 1947. Assistant inspector, Rhode Island State Board Public Roads, 1929–30; graduate assistant, Brown, 1930–32; mining geologist, Bendigo Mines, Ltd., Australia, 1934–36; field geologist, United States Geological Survey, Colorado, 1936; graduate assistant of geology, Harvard, 1936–37; consulting geologist, Mining Co., of Oruro, Bolivia, 1937; recorder, United States Geological Survey, 1938; geologist, Cerro de Pasco Copper Corp., Peru, 1938–40; industrial specialist, War Production Board, Washington, D. C., 1942–44; mineral economist, United States Bureau of Mines, 1944–45; acting chief of nonmetallic minerals section, mining division, War Production Board, 1945; commodity geologist, United States Geological Survey, 1946–47; staff geologist, 1947. Member: Institute of Mining and Metallurgical Engineers; Geography Union; Society of Economic Geology; Geological Society of Washington; American Association for the Advancement of Science. Also listed in the directory of the American Institute of Mining and Metallurgical Engineers.

Croston, John: Listed in membership directory of the American Institute of Mining and Metallurgical Engineers. Director, Nonferrous Metals Area, National Security Resources Board, Executive Office of the President.

Lasky, Samuel G.: Listed in American Men in Science. Geologist, United States Geological Survey, Washington, D. C. Born: Denver, Colo., July 22, 1901. Educated: Colorado School of Mines, E. M. 1922; Yale, M. S. 1929. Business: Metal and construction engineer in charge of construction, Rosario Mines, Honduras, 1922–24; teaching fellowship, Colorado School of Mines, 1924–25; mining engineer and geologist, Kennecott Copper Corp., Alaska, 1925–28; geologist, State Bureau of Mines and Mineral Resources, New Mexico, 1929–31; United States Geological Survey 1931, Chief of the Mineral Resources Section 1948. Member: American Institute of Mining and Metallurgical Engineers; Society of Economic Geologists; Geological Society of America; Washington Academy. Also listed in Who's Who in Engineering and directory of membership of American Institute of Mining and Metallurgical Engineers.

Lovering, Thomas S.: Mining geologist. United States Navy, 1917–19; Yale expedition to Newfoundland and Labrador, 1920; instructor, University of Minnesota, 1922–24; instructor, University of Arizona, 1924–25; junior geologist, United States Geological Survey, 1925–26, assistant geologist, 1926–29, associate geologist, 1929–38, geologist, 1938–46; associate professor of geology, University of Michigan, 1934–38; professor (on leave) 1938–47; geologist, United States Geological Survey, investigating mineral deposits for production programs at Eureka, Utah, 1942–46; staff research geologist, United States Geological Survey, Metals Section, Washington, D. C., since 1946. Author: Minerals in World Affairs (1943). Listed in American Men in Science. Born: St. Paul, Minn., May 12, 1896. Educated: University of Minnesota, E. M. 1922, M. S. 1923, Ph. D. 1924. Member: National Academy; Geological Society of America; Association of Petroleum Geologists; American Institute of Mining and Metallurgical Engineers; Geographical Union; Minerals Society; Society of Economic Geology; Geological Society of Washington; Geological Society of Michigan; Colorado

Science Society. Also listed in Who's Who in Engineering, Directory of American Institute of Mining and Metallurgical Engineers, and American Association for the Advancement of Science.

EDITORIAL

Brooke, Edgar D.: Director, Editorial Services Division, Office of Public Information, National Production Authority.

Schwartz, Charles: Employment reporter and later assistant city editor, Chicago Daily News, 1926–34; assistant to the president of Universal Pictures Corp., 1934–35; assistant to the Secretary and later Director of Information of Treasury Department, 1935–43; major, United States Army, active military service, 1943–46; business editor, World Report magazine, 1946–48; Director of Information, National Security Resources Board, 1948 to present. Member: National Press Club; Sigma Delta Chi; American Academy of Political Science.

LEGAL

Chayes, Abram: Abram J. Chayes is listed as attorney in Washington, D. C., in Martindale and Hubbell.

STATISTICS

Spencer, Vivian Eberle: Listed in directory of membership of American Statistical Association, and American Men in Science. With the United States Bureau of Census, Washington. Born: New Castle, Pa., October 27, 1907. Education: Oberlin College, A. B. 1928, M. A. 1929; University of Pittsburgh, 1929–33; University of Chicago, 1930, '31, '33 (summers); Columbia University, 1934; University of Pennsylvania, 1933–35, Ph.D. 1936. Business: Graduate assistant of mathematics, University of Pittsburgh, 1929–33; associate economist, national research project, Philadelphia, 1936–39; senior and later principal statistician, United States Bureau of the Census, 1940. Member: Mathematics Society; Mathematics Association; Statistical Society.

Wardwell, Charles A. R.: Member of American Economic Association since 1929. Chief, Current Business Analysis Division, Office of Business Economics, Bureau of Foreign and Domestic Commerce, Department of Commerce. Listed in directory of membership of American Statistical Association.

FORECASTS

Many of the conclusions and recommendations of the President's Materials Policy Commission hinge on the accuracy of the Commission's 1975 forecasts of the supply-demand relationship of various materials.

Population estimates for the year 1975 are the basis of many other predictions. In volume II, page 5, the Commission says: "The principal factors leading toward increased materials needs are the growth in population and increase in productivity."

The Commission has assumed a population of 193 million in 1975. If the Commission's estimates of population are grossly inaccurate, every other projection will be affected. It thus becomes necessary to appraise the possible accuracy of these estimates of this country's future position.

A review of the record shows that many of the leading authorities of their period in the past have attempted to forecast the future. While this Presidential Commission can claim that its techniques are sound, we will have to wait another 25 years to determine their accuracy.

Fortunately, we are in a position to review some of the earlier forecasts since many of them attempted to predict America's position in the years which have already become history.

On October 11, 1932, President Hoover released a report entitled "Recent Social Trends in the United States," prepared by a committee under the chairmanship of Dr. Wesley C. Mitchell, one of the Nation's most eminent social scientists. This Commission asked Drs. Warren S. Thompson and P. K. Whelpton, two of the ablest population experts, to prepare the monograph on population. Drs. Thompson and Whelpton made these predictions:

"It seems likely that the growth of population will be small in the future. Continuation of recent trends would mean that the population probably will be between 132,500,000 and 134,000,000 in 1940, between 140,500,000 and 145,000,000 in 1950 and between 145,000,000 and 170,000,000 in 1980.

"The growth of population in the future is certain to be much slower than in the past. Although death rates have fallen somewhat, particularly at younger

ages, these savings have been much more than offset by decreases in birth rates. Decreases have been much larger in the later part of the childbearing period than the earlier part, among foreign-born white women than among native white or Negro women and in rural than in urban areas. The continuation of these trends, together with the restriction of immigration will result in a net addition to the population from 1930 to 1950 of about the same size as that from 1920 to 1930. After 1950, growth will be slower. It is even possible that the population will begin to decline after reaching approximately 146 million in 1970."

The forecast of Drs. Thompson and Whelpton, it will be recalled, estimated a population between 140.5 and 145 million for 1950. The actual population in 1950 was 150.2 million, and it is now 160 million.

In May of 1938, the National Resources Committee, appointed by President Roosevelt, released a population study entitled "the Problems of a Changing Population." This study was made by its science committee and included among its members the foremost experts in this field. The individual's participating in the preparation of this report were members of organizations such as the National Academy of Science, the Social Science Research Council, the American Council of Education, and the Scripps Foundation. Drs. Thompson and Whelpton again were responsible for the detailed population forecasts. The committee said:

"The most recent estimates of future population change, prepared for this report by Warren S. Thompson and P. K. Whelpton, are based on three sets of hypotheses for birth rates and for death rates. On the assumption of medium fertility and mortality rates, population will continue to grow for 50 years but at a constantly decreasing rate, reaching 153 million in 1980. Assuming a net immigration of 100,000 persons per year from 1940 on, the figure for 1980 is raised to 158 million. Even with the highest rates that can reasonably be assumed, there would be a natural increase of less than 50 million from 1935 to 1980. The minimum estimate assumes a decline of about one-third in the fertility of native white women from the 1930–34 level to 1980, with no net accession of immigrants. This estimate gives a peak population of 138 million in 1955, with a decrease of 10 million during the next quarter century."

Needless to say, these 1938 forecasts look quite ridiculous in retrospect—yet forecasts today, which may be no better, are the basis for the Paley Committee's conclusion and its far-reaching recommendations.

Again in December 1938, Dr. Isadore Lubin, then the Commissioner of Labor Statistics in the Department of Labor and recently the United States delegate to the Economic and Social Council of the United Nations, testified before the Temporary National Economic Committee as follows:

"I want to turn to exhibit 4, which shows the trend of population growth in the United States.

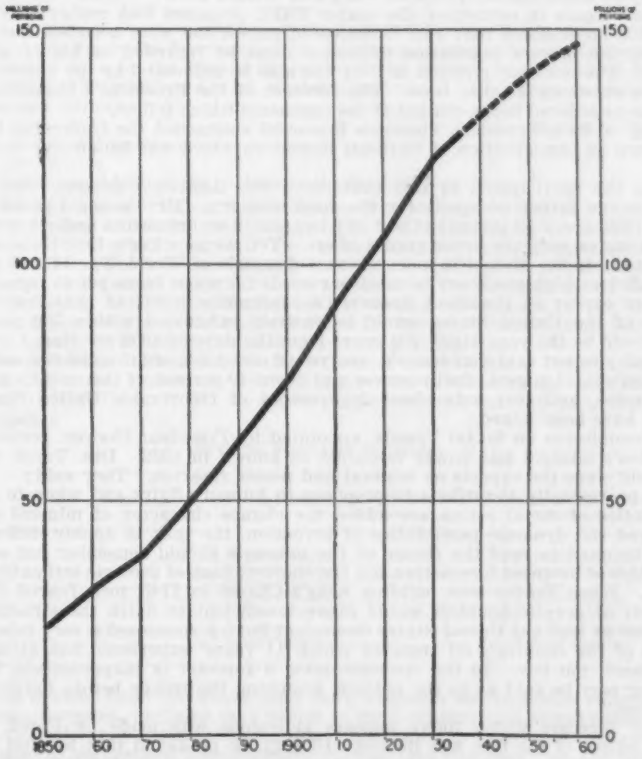
"If you go back to 1850, the middle of the last century, you will note that the increase in population from that year to 1935, was from 23 million people to 127 million. Such estimates as are available place the estimated population in 1940, 2 years hence, at approximately 132 million people.

"The significant fact that should be brought out is that between 1850 and 1880 our population doubled. Between 1880 and 1910, 30 years later, population increased by 80 percent.

"Between 1910 and estimated 1940 a similar period of 30 years, it is estimated our population will have increased 43 percent and the estimated increase in population from 1940 to 1960 will be about 10 percent. In other words, the rate of increase of our population has been steadily going downward, so that in 1960 it is estimated that there will be but 10 percent more people in the United States than there will be in 1940."

(Exhibit No. 4)

UNITED STATES POPULATION



NATIONAL RESOURCES COMMITTEE ESTIMATES

America's population is increasing much more slowly than in the past. From 1870 to 1900 population doubled, increasing at an average rate of two and one-third percent a year. From 1900 to 1920, just before the new immigration laws became effective, the average annual rate of increase was one and two-thirds percent; from 1920 to 1935, slightly over one percent. From 1940 to 1960 it is estimated that the rate of gain will be only one-half of one percent per year.

Dr. Lubin's forecast for 1960, i. e., 10 percent more people than in 1940, would give us a 1960 population of approximately 145 million people. History shows that this goal was actually attained in 1947.

It will be recalled that the hearings of the Temporary National Economic Committee revolved around the mature economy thesis. It assumed there were no more opportunities for private investment in this country because there were no new frontiers; and we must expect a declining population. Therefore, the only way we could put our people to work was to have the Government make jobs for them. Again in retrospect, the major TNEC premises look rather silly.

There is no evidence that past forecasts of population were accurate and accordingly the present population estimates must be regarded as highly questionable. The minerals position in 1975 will also be influenced by the known reserves in existence at that time. The forecast of the President's Commission should be considered in the context of the comments which follow.

In May of 1908, President Theodore Roosevelt summoned the Governors to a Conference on Conservation of National Resources which was held at the White House.

Among the participants in this conference was Andrew Carnegie, who reported on the future prospects for the steel industry. Mr. Carnegie predicted that by 1938, about 50 percent of our iron ore would be exhausted and we would be operating on only the lower grades of ore. Yet, we now know that there was sufficient ore in the Mesabi to meet the vast demands of World War II and still leave sufficient high grade ore to meet our needs for some years yet to come.

Another expert at President Roosevelt's conference predicted that the coal deposits of the United States would be entirely exhausted within 200 years, which would be the year 2108—200 years from the date of 1908 meeting.

The Paley report said that today's reserves of coal are more than 90 percent of the Nation's total mineral fuel reserves and about 40 percent of the world's total coal reserves, and that only about 2½ percent of recoverable United States reserves have been mined.

The Commission on Social Trends, appointed by President Hoover, reviewed the Nation's mineral and power resources as known in 1932. Drs. Tryon and Schoenfeld were the experts on mineral and power reserves. They said:

"It is proverbially hazardous to prophesy in human affairs and when to the uncertainties of social action are added the chance character of mineral discovery and the dynamic possibilities of invention, the task is doubly difficult. Anyone tempted to read the future of the minerals should remember not only the troubles of business forecasters, but the shortcomings of geologic estimates of reserves. When Boston was building King's Chapel in 1745, men feared that the supply of granite boulders would prove insufficient to finish the structure, and as late as 1920 the United States Geological Survey sponsored a very careful estimate of the country's oil reserves which 11 years' experience has already proved much too low. In the circumstances, a forecast is inappropriate, but something may be said as to the outlook, assuming the trends before indicated to continue."

Another forecast which today appears ridiculous was made by Floyd W. Parsons, editor of the Gas Age Record. In 1921, he predicted that by 1941 we would have completely exhausted our petroleum reserves and that the peak of natural gas production had already been passed. He also said that we were already approaching exhaustion of our coal and iron ore reserves.

"The world has used more of its mineral resources in the last 21 years than in all preceding history. The per capita consumption of minerals has increased sevenfold since 1900. While we have not mined 2 percent of our original supply of coal in the United States, we have exhausted 33 percent of our high-grade beds. There are only limited reserves of low volatile smokeless coals, and high volatile gas coals are being rapidly exhausted. We have huge reserves of iron ores, but the high-grade deposits have the possibility of being exhausted at a comparatively early date. It is probable that if business were to catch its stride through the whole world, and normal advances were to be made, we would see the practical end of copper mining in the United States within the present generation. Of oil, there remains in the ground (in 1921) about 9 billion barrels, or only enough to satisfy our present requirements for 20 years. Meanwhile requirements, particularly for motortrucks, oil-burning ships, and airplanes, are on the increase. We have exhausted more of our oil reserves since August 1914, than in all previous years. The peak of natural-gas production has been passed, the supply diminishes, and so the chapter of this wonder fuel draws to its close."

On June 27, 1935, one of the most eminent experts in the field of mineral economics, Dr. C. K. Leith, of the University of Wisconsin, delivered an address

at a symposium on conservation jointly sponsored by the University of Minnesota and the American Association for the Advancement of Science at Minneapolis. He said:

"In terms of years of measured reserves of present commercial grade the United States has supplies of oil, zinc, and lead for about 15 to 20 years. Its copper supply is good for about 40 years."

We should now be running out of oil, zinc, and lead—yet we find that our reserves in each case are larger than they were at the time of Dr. Leith's prediction.

Another more recent forecast was made by Harry Dexter White who on March 7, 1944, in a letter to the Secretary of the Treasury Morgenthau proposed a multi-billion dollar loan by the United States to Soviet Russia, as the United States would shortly be running out of strategic materials. His letter to Secretary Morgenthau follows:

MARCH 7, 1944.

To: Secretary Morgenthau.
From: Mr. White.
Subject: Proposed United States loan to the U. S. S. R.

The following memorandum is in reference to your request that the feasibility of the extension of a large credit to the U. S. S. R. in exchange for needed strategic raw materials be explored. Your opinion that such an arrangement might well be feasible appears to us to be supported by our study of the possibilities.

1. Recent confidential reports on our raw-material resources prepared for the Under Secretary of Interior disclose an increasing dependence of the United States on foreign sources of supply for strategic raw materials because domestic reserves have been seriously diminished or virtually depleted.

2. The following table indicates the extent of United States current reserve supplies for some important strategic materials which can be produced in quantity in the U. S. S. R., in terms of prewar and current war, domestic requirements:

Reserve domestic supplies

	On basis of our 1938 domestic consumption	On basis of our current consumption, 1943
Petroleum	16 years' supply	13 years' supply.
Manganese	9 years' supply	3 years' supply.
Tungsten	23 years' supply	Do.
Zinc	17 years' supply	8 years' supply.
Lead	7 years' supply	6 years' supply.
Chrome	No record	Less than 1 year's supply.
Mercury	3 years' supply	2 years' supply.

3. It is evident from the above table that, although our domestic reserves of petroleum, tungsten, and zinc may suffice to meet consumption requirements for the next decade, they will be almost entirely dissipated by the end of that period; in the case of manganese, chrome, mercury, and lead our resources are too limited to satisfy even probable domestic requirements of the next 10 years. The number of strategic materials for which our reserves are very low and which can be produced in the U. S. S. R. is greater than indicated above, and includes platinum, vanadium, graphite, and mica.

4. Although our reserves of strategic materials could be somewhat expanded, given an increase in price to make possible further development of marginal resources, the necessity of growing United States dependence on foreign sources of supply in order to satisfy anticipated postwar industrial requirements and to maintain adequate security reserves, is inescapable. (See attachment I for complete table on United States metal reserves.)

U. S. S. R.—UNTAPPED RAW MATERIALS RESERVOIR

1. The U. S. S. R. is richly provided with a wide range of strategic raw materials, including metals, minerals, timber, and petroleum, but the unequal degrees to which these have been developed will limit the number and volume that may be available for export in the immediate postwar years.

2. Rapid economic reconstruction and expanded resources development could greatly enhance the export surplus of the U. S. S. R., could sustain large-scale exports of metal and metallic ores, petroleum, and timber at an average value of

at least $500 million, not including exports of other materials, such as furs and semimanufactures.

3. It therefore appears that a financial agreement whereby the United States would extend a credit of $5 billion to the U. S. S. R. for the purchase of industrial and agricultural products over a 5-year period, to be repaid in full over a 30-year period, chiefly in form of raw material exports, would not only be advantageous to the United States, as well as helpful to the U. S. S. R. but would be within the limits of feasible trade betwen the two countries, since the amount we would wish to purchase would be in excess of the repayment which the U. S. S. R. would be required to make under the proposed loan terms. (See attachment II for suggested terms of U. S. S. R. repayment for United States credits.)

IS THE PROPOSED FINANCIAL AGREEMENT PRACTICAL AND DESIRABLE?

The proposed financial agreement appears practical because:

1. The prewar restricted pattern of trade should not be used to define the potentials of postwar trade between the United States and U. S. S. R., since both economies have been fundamentally restructured by the war. In both the United States and U. S. S. R., the accelerated expansion of production capacity and national output which has been achieved during the last 3 years indicates the new and larger dimensions which foreign trade can assume in both economies in the postwar period. (See attachment III for a summary of United States-U. S. S. R. trade relations during the interwar period 1918–1938.)

(*a*) The low level of prewar international trade relations were both a symptom and a cause of deteriorated economic and political international relations. It is realistic to assume that as compared with prewar years a decreasing proportion of expanding Soviet resources will be devoted to war industries, thereby creating an enlarged export potential through the release of resources.

3. Since the U. S. S. R. has completely state-controlled economy, the extent and character of its surpluses and deficits (i. e., imports and exports) are largely determined by planning decisions covering the allocation of manpower, materials, and equipment, it will be possible for the United States to influence the Soviet pattern of anticipated national surpluses and deficits.

4. If United States trade plans are premised on an expanded volume of trade and a correlative increase of United States import requirements, the expansion of trade between the United States and U. S. S. R. need not necessarily involve a reduction in total United States imports from other areas.

The proposed financial agreement appears desirable because:

1. The United States will obtain access to an important source of strategic raw materials which are expected to be in short supply in the United States after the war.

2. The United States will also be assured an important market for its industrial products since the U. S. S. R. represents one of the largest single sources of demand in Europe and is ideally suited to supply us with a large and varied backlog of orders for both producers' and consumers' goods. Such a sustained demand could make an important contribution to the maintenace of full employment during our transition to a peace economy.

3. Moreover, the United States will not only be assured a desirable market because of the anticipated volume of demand the U. S. S. R. will exercise, but because of its superior repayment potential compared with other foreign buyers of American products.

4. An arrangement of this character would provide a sound basis for continued collaboration between the two Governments in the postwar period.

39888 O—54—pt. 8——9

ATTACHMENT I.—*Estimated production, consumption, prices, and reserves of selected important minerals in 1943*

Mineral	Estimated production (000 units)	Estimated average price ($000,000)	Estimated domestic consumption (000)	Estimated price ($000,000)	Current estimated reserves (000 units)	Reserve supply in terms of current annual consumption (years)
Bituminous coal	589,000 short tons	1,561	582,000 short tons	1,542	1,407,808,291 tons	2,419
Anthracite	60,327 short tons	302	56,800 short tons	284	15,415,602 tons	271
Petroleum	1,503,000 barrels	1,819	1,507,000 barrels	1,823	19,017,756 barrels	18
Iron ore	113,554 short tons	275	111,500 short tons	270	1,715,000 short tons	15
Manganese, 35 percent manganese	172 long tons		1,400 long tons		4,650 long tons	3
Chromite, all grades	100 long tons	3	900 long tons	30	20 long tons	(1)
Vanadium	2.7 short tons	3	3.4 short tons	4	3.8 short tons	1
Tungsten	5.7 short tons		10 short tons		34.6 short tons	3
Molybdenum	29.5 short tons	42	25.1 short tons	36	800 short tons	32
Copper	1,088 short tons	283	1,624 short tons	422	25,000 short tons	85
Lead	446 short tons	66	717 short tons	106	4,000 short tons	6
Zinc	741 short tons	167	900 short tons	203	7,000 short tons	8
Mercury	53.5 flasks	10	55.2 flasks	11	110 flasks	2
Bauxite, all grades	7,026 short tons	27	5,340 short tons	21	18,000 long tons	4
Fluorspar	408 short tons	12	386 short tons	12	10,000 short tons	26
Magnesite	860 short tons	9	860 short tons	9	50,000 tons [2]	58
Phosphate rock	5,000 short tons	21	5,208 short tons	19	3,322,000 long tons	714
Potash (K_2O)	700 short tons	24	630 short tons	21	75,000 short tons	119
Sulfur	3,100 short tons	59	2,900 short tons	40	94,000 short tons	32

[1] Less than 1 year.
[2] Magnesite plus dolomite.

Source: Preliminary Estimates of Reserves of Important Minerals in the Ground as of Jan. 1, 1945, Department of Interior, Geological Survey.

A final prediction which has not materialized is contained in the presidential address by G. F. Laycock to the Institution of Mining and Metallurgy of Great Britain in 1946. Mr. Laycock, an eminent authority, predicted that within 14 years the lead supply of the world would no longer be sufficient. More than one-half of the 14 years have elapsed and known lead reserves are greater today than they were when Mr. Laycock made his address. He said:

"As far as I can learn from the information available, there would appear to be only sufficient known resources of the ores of lead in the world at the present time to last for about another 14 years at the prewar rate of consumption. In the case of zinc the period is undoubtedly longer—probably about 21 years. That does not imply that all the present mines which are producing lead and zinc will be worked out in that comparatively short time. Some of them no doubt have much longer lives at their current rate of production, but it does certainly look as if the total world supply will in a few years begin to decrease and before long will be insufficient to fill all requirements."

One could argue at length about the validity of the techniques used by the Commission's staff in estimating the demand-supply relationships for 1975. The estimates of President Truman's Commission and its forecasters may look equally ridiculous to those who will be reviewing them in the year 1975.

This section includes an article, reprinted from the American Economic Review, by Joseph S. Davis, director of the food research institute of Stanford University. Dr. Davis shows that earlier population forecasts have been uniformly inaccurate. It throws considerable light on the problems of making long-range forecasts, such as those attempted by the Commission.

Attention is also directed to an annotated article which is included in this section and to three articles which follow chapter XVII of this report by Dr. David White, Chief Geologist of the United States Geological Survey, in the early 1920's. These articles attempted to predict the future as does the report of the President's Materials Policy Commission. They predicted unequivocally that all of the petroleum resources of the United States would be exhausted long before 1952.

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OUR CHANGED POPULATION OUTLOOK AND ITS SIGNIFICANCE

By JOSEPH S. DAVIS*

The population of the continental United States has radically changed in numbers, age composition, and marital composition since 1940. Numbers alone increased by about 25.1 million in the 12½ years from September 1, 1939 to March 1, 1952. The most striking increases were in young children under 5, 10, and 15 and in persons 65 and over. The number of married couples has greatly risen while the proportion of single persons 14 and over has impressively declined. More important, accumulating data leave no room for doubt that our population outlook has undergone an astounding if not revolutionary reversal in 1947-52.

American demographers, official and unofficial, are increasingly recognizing these facts,[1] although they have been slow to acknowledge the upset of their best forecasts and their firmest convictions, and are naturally reluctant to go on record with revised ones. But the character and extent of the changes, and their profound economic and social significance, are not yet generally realized in academic and business circles. Obsolete views based on obsolete data are common in text and reference books in current use, and keep appearing in new scholarly books, articles, book reviews, and manuscripts. In the social sciences there is a serious lag between exposure of significant error and its correction in

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[1] Significant references include: Jacob S. Siegel and Helen L. White, *Illustrative Projections of the Population of the United States, 1950 to 1960*, Bur. Census, Ser. P-25, No. 43, Aug. 10, 1950; Harold F. Dorn (Nat. Inst. of Health), "Pitfalls in Population Forecasts and Projections" (read at association meetings, Dec. 28, 1949), *Jour. Am. Stat. Assn.*, Vol. LXV (Sept., 1950), pp. 311-34; Margaret J. Hagood and Jacob S. Siegel, "Projections of the Regional Distribution of the Population of the United States to 1975," *Agr. Econ. Res.* (Bur. Agr. Econ.), Vol. III (Apr., 1951), pp. 41-52; Frank W. Notestein, "Population," *Scien. Amer.*, Vol. 185 (Sept., 1951), pp. 28-35; Louis I. Dublin and Mortimer Spiegelman, "Health Progress Among Industrial Policy Holders, 1946 to 1950," *Soc. Actuaries Trans.*, Vol. III (Sept., 1951), pp. 294-328 (the Metropolitan Life Ins. Co. *Stat. Bull.*, for which they are primarily responsible, has in recent years amply recognized the change); Henry S. Shryock, Jr., "Redistribution of Population: 1940 to 1950" (read at association meeting, Dec. 27, 1950), *Jour. Am. Stat. Assn.*, Vol. XLVI (Dec., 1951), pp. 417-37; P. K. Whelpton and J. V. Grauman, "Population: Prospects and Problems in 1960," *Dun's Rev.* (Jan., 1952), pp. 13-14, 60-74; Clyde V. Kiser, "Fertility Trends and Differentials in the United States," *Jour. Am. Stat. Assn.*, Vol. XLVII (Mar., 1952), pp. 25-48.

professional literature and university classrooms. In this area of fundamental importance for much economic analysis, the economic journals have hitherto contributed almost nothing to overcome the lag.

Though government and business economists are more alive to the changes, Drucker recently went so far as to say:

> In every important respect—in total numbers, in age distribution, and in employability—the actual development of our population is almost the exact opposite of that on which many managements, largely without conscious realization, base their capital investment, their product development and marketing, and their employment practices.[2]

The 1950 annual report of the Bank for International Settlements contains this striking sentence: "It has proved singularly difficult . . . to liberate men's minds from the hold which prewar ideas and policies had obtained over them."[3] This is emphatically true in the limited field here under consideration.

The primary purpose of this article is to summarize the evidence of the population changes that have already occurred, in contrast with expectations of the foremost experts, and to indicate what can—and what cannot—be reasonably asserted about further developments in the next few decades.[4] A second purpose is to bring out important aspects of the significance of the new outlook as compared with the old, without pretending to exhaust this topic. If economists will only catch up and keep up with the basic demographic evidence, they will find manifold applications in their individual work. I have deliberately refrained from speculations about our "ideal population" or the state of the American economy and society in 1980 or 2000, to say nothing of extending my range to include the rest of the world; and I have not attempted to deal convincingly with questions about our ability to produce what the much larger population in prospect will want to consume.

Changes in Position and Outlook

The conviction that the United States population would soon reach a virtual peak, and either table off or more probably decline, gained

[2] Peter F. Drucker, "Population Trends and Management Policies," *Harvard Bus. Rev.*, Vol. XXIX (May, 1951), pp. 73-88. See also his earlier popular article, "Are We Having Too Many Babies?," *Sat. Eve. Post*, May 6, 1950, pp. 40ff.

[3] *Fed. Reserve Bull.*, Vol. XXXVII (Sept. 1951), p. 1107.

[4] This paper, containing important fresh evidence, is essentially a sequel to my condensed monograph, *The Population Upsurge in the United States* (Food Research Inst. War-Peace Pamph. 12, Dec. 1949). Three other papers in 1949-50 grew out of the same study: "Our Amazing Population Upsurge," *Jour. Farm Econ.*, Vol. XXXI (Nov., 1949), pp. 765-78; "Agriculture and the New Population Outlook" (Nat. Agr. Credit Com., Jan. 30, 1950, mimeo.); "Fifty Million More Americans," *For. Affairs*, Vol. XXVIII (Apr., 1950), pp. 412-26.

ground in the 1920's and became general by the end of the 1930's.[5] The long-term decline in the birth rate was accelerated in the 1920's and 1930's. Births as well declined between 1924 and 1936; immigration dried up in the 1930's; and the crude death rate of our "aging population" seemed to be approaching a minimum from which it could only rise. One of the favored forecasts of 1938 (Chart 1, *ml0*) put our peak population below 140 million, to be reached about 1960; another put it at about 154 million (*mm0*), to be reached about 1980.[6] Actually, the lower figure was passed in mid-1947, the higher in mid-1951. These and later forecasts rested on trend analyses and extrapolations that time has proved thoroughly unsound.

The same conviction persisted in the 1940's, though revisions were made in detailed projections and forecasts in 1943, 1946-47, and early 1949. As late as 1947 one leading authority (Whelpton) viewed the prospective decline optimistically: he considered our "economic optimum" population well below the current level, perhaps as low as 100 million.[7] Another (Baker) viewed with alarm the prospect, as he sized it up, that our population might fall to 100 million within a century, if not by the year 2000.[8] As late as mid-1950, the standing official estimate of our *peak* population was 165 million, and a decline before this

[5] Of the long series of possible references, six will suffice: Raymond Pearl and Lowell J. Reed, "On the Rate of Growth of the Population of the United States since 1790 and its Mathematical Representation," *Proceedings Nat. Acad. Sci.*, Vol. VI (June, 1920), pp. 275-88; Louis I. Dublin, ed., *Population Problems in the United States and Canada* (Boston, Houghton Mifflin, 1926); Warren S. Thompson and P. K. Whelpton, "Population Trends in the United States," *Recent Social Trends in the United States* (New York, McGraw-Hill, 1933); Lowell J. Reed, "Population Growth and Forecasts," *Annals Am. Acad. Pol. and Soc. Sci.*, Vol. 188 (Nov., 1936), pp. 159-66, esp. p. 163; Nat. Research Com., Com. on Population Problems, *The Problems of a Changing Population* (Washington, May 1938); P. K. Whelpton, *Forecasts of the Population of the United States, 1945 to 1975* (Bur. Census, 1947).

[6] The letters *m*, *l*, and *h* mean medium, low, and high respectively. The first letter in a series such as *m l 0* refer to assumed mortality rates, the second to assumed fertility rates. The figures *0*, *125*, etc., refer to the assumed number of thousands of net in-migrants per year—including returned citizens, foreign visitors, and migrants from Puerto Rico and other outlying territories, none of whom can properly be termed "immigrants."

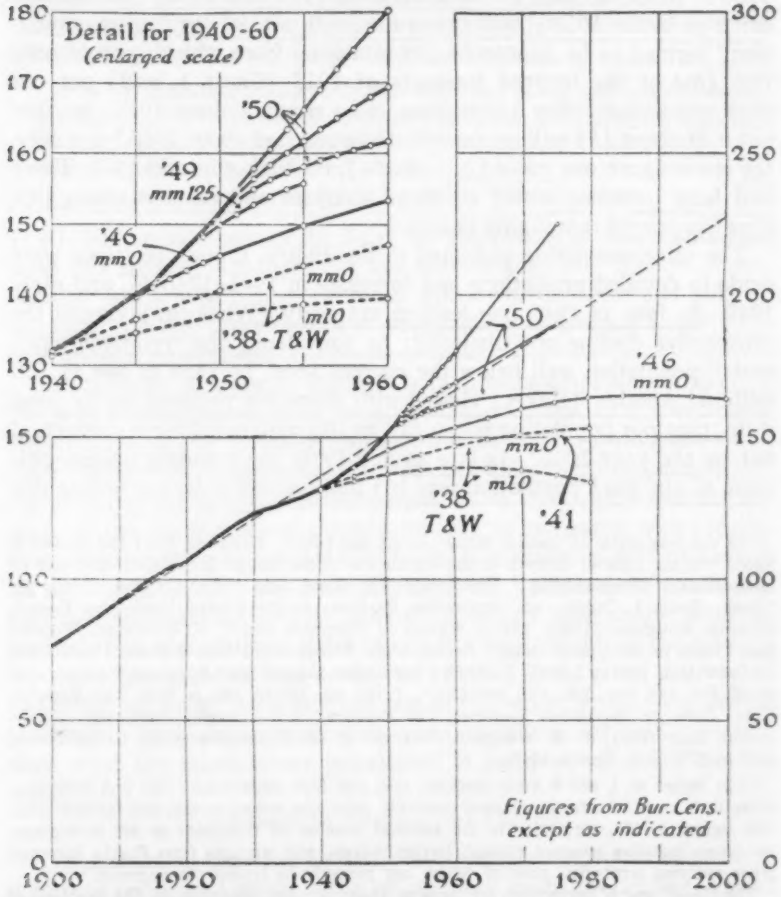
The *'38—T and W* projections are those of Thompson and Whelpton, in *The Problems of a Changing Population*, cited in footnote 5; the Census Bureau published the *'38 m m 0* projection as its own *'41* forecast in *Current Population Reports*, Ser. P-3, No. 15, July 23, 1941. The *'46* projection was the Census Bureau's advance publication (Ser. P-46, No. 7, Sept. 15, 1946) of one that later appeared in Whelpton, *Forecasts*, cited in footnote 5. The *'49* projection was the Census Bureau's own, given in Ser. P-25, No. 18, Feb. 14, 1949. The *'50* projections are in Siegel and White, cited in footnote 1.

[7] Whelpton, *Forecasts*, p. 64.

[8] O. E. Baker, "The Population Prospect in Relation to the World's Agricultural Resources" (address at Columbus, Ohio, Dec. 27, 1946, before National Council of Geography Teachers).

CHART 1.—UNITED STATES POPULATION, 1900-51, WITH SELECTED PROJECTIONS TO 1960, 1975, AND 2000*

(Million persons)



* Latest revised official estimates of the mid-year population of the continental United States, including armed forces overseas, are indicated by the heavy solid line. The thin dashed line merely connects points for 1900 and 1950 and is extended to 2000. The other lines indicate selected projections. Sources of these, with interpretative comments, are given in footnote 6.

While this article was being set up in type, the Census Bureau released a "provisional revision" of these projections for July 1, 1953-60. *Current Population Reports*, Ser. P-25, No. 58, Apr. 17, 1952.

century's end was indicated.[9] These convictions, forecasts, and opinions are now wholly obsolete.

Chart 1 shows a continuous curve (heavy solid line) representing standing estimates of the population of the continental United States annually as of July 1, 1900-51. In this period the population roughly doubled. A bulge appears in the 1920's, a flattening in the 1930's, and a striking upsurge in the 1940's that is not yet terminated. The decennial rate of increase in 1940-50 was as high as the average in 1900-50. The rate of *natural* increase (excess of births over deaths) in the 1940's was similar to that in the two decades centering in 1900. And the annual rates of increase in 1947-51 were not far below those of 1900-10, when immigration was relatively far greater.

Chart 1 also shows two favored projections (*ml0* and *mm0*) published in May 1938, the Census Bureau forecasts of July 1941 and September 1946 (both *mm0*), and the Bureau's three "illustrative projections" to 1960, which in August 1950 replaced the standing official forecast.[10] Of these latest only the low projection, based on assumptions that now seem unrealistic, fits roughly with the former *forecasts*. The medium projection, as "unofficially" extended by the Census Bureau to 1975, points to 190 million in that year.[11] Our actual population growth since mid-1950 more nearly approaches the growth indicated by the high projection,[12] which points to 225 million in 1975—though some of its assumptions now seem incredible. The wide range of 60 million between the low and the high projections for 1975 reflects chiefly the utter inability (only recently acknowledged) to forecast births beyond a year. The Census Bureau now wisely avoids use of the term forecasts, and rightly refrains from stressing the medium projection.

The extent of the reversal of earlier expectations is underscored by the fact that our population increase in 1940-50 (July 1 basis, including armed forces overseas) was 19.6 million, whereas Hansen, in his impressive address of December 1938, had confidently expected it to be only 5-6 million.[13] The Census Bureau forecast of mid-September

[9] The curve shown on Chart 1 as *'46 mm0*, which was not formally disavowed even by the new official projections of Aug. 10, 1950.

[10] Siegel and White, *op. cit.*, p. 7 (including armed forces overseas).

[11] Hagood and Siegel, *op. cit.*, p. 47 (excluding armed forces overseas).

[12] True through February 1952, the latest month for which data are yet available. The actual increase in July-June 1950-51 was 2,664,000, as compared with 2,343,000 indicated by the mid-1950 medium projection and 2,874,000 by the high projection. The official forecast of early 1949 (*mm125* basis) had indicated an increase of only 1,513,000 in 1950-51. The official 1946 forecast had pointed to an increase of 4,380,000 in 1950-55.

[13] Alvin H. Hansen, "Economic Progress and Declining Population Growth," *Am. Econ. Rev.*, Vol. XXIX (March, 1939), pp. 1-15, See *'38 ml0* curve on Chart 1.

1946 indicated an increase of 4.6 million in the four years ending June 30, 1950. The actual increase was more than twice as large. The Bureau's estimates released on February 14, 1949 pointed to an increase of 5.2 million in the three years ending June 30, 1951. The actual increase was nearly 50 per cent larger.

In this wholly unexpected and remarkably protracted recent upsurge, three factors all contributed: net in-migration substantially exceeded the forecasts, deaths fell below the numbers assumed, and births far outstripped the expected figures.

Net in-migration was generally ignored in the favored projections of 1937-47, though Whelpton was inclined to prefer the assumption of 100,000 per year. The annual average for the decade 1940-50 was 160,000.[14] The Census Bureau forecast of February 1949 assumed an average of 125,000 a year, or a total of 1,000,000, in the *eight* years ending July 1, 1955. The actual total in the first *three* of these years was nearly 1,000,000.

Despite the hazards of war, deaths in the calendar years of 1940-45 continued on much the same absolute level as in the preceding 30 years, with a peak in 1943 far lower than that in the influenza year 1918. Despite special hazards attending the high birth rates of 1946-51, and disproportionate increases in numbers of the elderly and aged, deaths in these six calendar years were only moderately higher (Chart 2). The crude death rate in each of the four years 1948-51 was under 10 per 1,000. The age-adjusted death rate continues to decline, and in 1950 was less than one-half of that in 1900. Two leading authorities recently went so far as to assert that "no serious student of mortality would guess when the death rate would reach a minimum and what it would be."[15]

The most striking contrast between expectations and events, however, was in the number of births. The latest revised estimates are shown in Chart 2 and the accompanying table on page 311, which also shows crude birth rates for 1909-51.

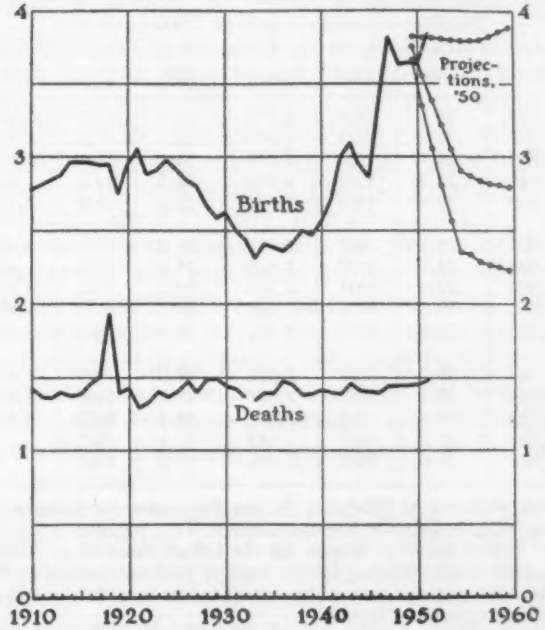
In both the fairly prosperous decade of the 1920's and the depression decade of the 1930's birth rates and births declined to very low levels. Demographers counted upon the downtrend to continue, though at a slowing rate. Our involvement in World War II was expected to alter the course of births but, on the whole, to accentuate the downward "trend." When the war years showed instead a marked increase in births and birth rates, this was interpreted in part as "catching up with arrears" due to the depression, and in part as "borrowing from the

[14] Shryock, *op. cit.*, p. 429, speaking of "net civilian immigration."

[15] Dublin and Spiegelman, *op. cit.*, p. 296.

future" or advancing the timing of births otherwise to be expected. After hostilities ended, a postwar peak in births was correctly anticipated, but the 1947 figure proved very much higher than was forecast. This peak was confidently expected to be followed by a sharp and persistent decline to and below the level of the 1930's, and any deferment

CHART 2.—BIRTHS AND DEATHS IN THE UNITED STATES, CALENDAR YEARS 1910-51, AND "ILLUSTRATIVE PROJECTIONS" OF BIRTHS, 1949-50 TO 1959-60[a]



[a] Births data in accompanying table. Projections data from Siegel and White, *op. cit.*, p. 5. Deaths data for 1910-32, adjusted for underregistration, from Thompson and Whelpton, *op. cit.*, p. 234; and from 1933, unadjusted, and excluding deaths in armed forces overseas, from annual and monthly publications of the National Office of Vital Statistics.

Revised projections for years ending June 30, 1953-60 are given in the source cited under Chart 1.

of this drop was expected to increase its severity when it came. Thus far the abrupt decline has not begun, and the hypothesis remains to be tested.

The annual average of 3,663,000 births in the calendar years 1946-51 is very high—25 per cent above the prewar record plateau of 1914-24 and 54 per cent higher than the prewar trough of 1932-37. It is difficult to find any historical precedent for so marked a rise from trough to plateau of births. Even more astounding, compared with expecta-

tions, 1951 births approximately equalled the 1947 peak. The moving 5-year total of births has been rising ever since 1937.

The number of children under 5, which had been strongly expected to continue the decline of 1920-40, in April 1950 was 41 per cent above the census-year peak of 1920 and 55 per cent higher than in April 1940. It has kept rising into early 1952. Whereas children under 5 had been firmly expected to constitute a continually declining fraction of our

LIVE BIRTHS AND BIRTH RATES, ADJUSTED FOR UNDERREGISTRATION, 1909–51[a]
(Numbers in thousands; rates per 1,000 population)

Year	Number	Rate	Year	Number	Rate	Year	Number	Rate[b]
1909	2,718	30.0	1924	2,979	26.1	1939	2,466	18.8
1910	2,777	30.1	1925	2,909	25.1	1940	2,558	19.4
1911	2,809	29.9	1926	2,839	24.2	1941	2,701	20.3
1912	2,840	29.8	1927	2,802	23.5	1942	2,988	22.2
1913	2,869	29.5	1928	2,674	22.2	1943	3,102	22.7
1914	2,966	29.9	1929	2,582	21.2	1944	2,938	21.2
1915	2,965	29.5	1930	2,618	21.3	1945	2,858	20.4
1916	2,964	29.1	1931	2,506	20.2	1946	3,411	24.1
1917	2,944	28.5	1932	2,440	19.5	1947	3,818	26.6
1918	2,948	28.6	1933	2,307	18.4	1948	3,638	24.9
1919	2,740	26.2	1934	2,396	19.0	1949	3,650	24.6
1920	2,950	27.7	1935	2,377	18.7	1950	3,628	24.0
1921	3,055	28.1	1936	2,355	18.4	1951	3,833[c]	25.0[c]
1922	2,882	26.2	1937	2,413	18.7	1952		
1923	2,910	26.0	1938	2,496	19.2	1953		

[a] For 1909–34, estimates of Whelpton, Scripps Foundation for Research in Population Problems; from 1935, estimates of National Office of Vital Statistics in the Public Health Service of the Federal Security Agency. See the latter's *Summary of Natality Statistics, United States, 1949* (Vital Statistics, Special Reports, National Summaries, Vol. XXXVI, No. 1), May 14, 1951, p. 4, and sources there cited; and its Press Release FSA-D62, Mar. 6, 1952, giving revised figures for 1941–50.

[b] For 1940–46, based on population including armed forces overseas; from 1947, based on population excluding armed forces overseas.

[c] Preliminary.

total population, this fraction has been rising for nearly 15 years. The number of children under 15 was smaller in 1940 than in 1920. In 1940-50 it rose by 8 million or 24.1 per cent. *These facts are of momentous significance.*

The recovery in crude birth rates has been greatest in groups (classified by income or economic status, education, urban-rural, etc.) where the preceding fall had been greatest.[16] Our recent birth rates, though low by various standards, are very high in comparison with the specialists' expectations for the past decade, and for the next as well. All three of the Census Bureau's 1950 projections imply declining birth

[16] Kiser, *op. cit.*, pp. 25, 37-48.

rates in the 1950's—the high series from 25.5 in 1949-50 to 21.8 in 1959-60, the medium from 25.0 to 16.6, the low from 24.4 to 13.9. The average age at first marriage has declined as the number of persons married has radically risen and the percentage of persons never married has fallen.[17] Between 1940 and 1950, while our population increased by nearly 15 per cent, the number of married couples rose by 24-26 per cent.

Chart 2 also shows, by fiscal years, the number of births assumed in the three 1950 official projections to 1959-60. Together, these reflect extreme uncertainty about the course of births in the 1950's. The low projection is in line with the views that have held sway for years. The medium projection is similar but implies a slower decline to a level well above that of the 1930's. The high projection seems fantastic to most authorities, yet births since mid-1950 have run closest to this projection. The eventual curve of births in 1950-60, however, will bear no close resemblance to any of the three projections.

It is still reasonable to expect within the present decade a trough in marriages, births, and population increase, in reflection of the trough of births in the 1930's and the extent to which women have tended to marry younger in recent years. The depth and duration of this trough, however, will be greatly influenced by the health of the American economy. Sharp declines in marriages and births may occur if we experience deep depression and severe unemployment. If years of hard times should be prevented, the demographic slump will presumably be much less pronounced.

With more assurance we can expect fresh upsurges in marriages and births beginning sometime in the 1960's and extending well into the 1970's, unless these should be repressed by seriously unfavorable economic conditions. These coming demographic swings deserve prominence in our attempts at analysis of the future, along with economic fluctuations that are no less unpredictable.

For years demographers, biologists, economists, and other specialists have held the firm conviction that population "trends" are reliably predictable. Emphatically, *they are not*. Baker wrote in 1930: "The population of the United States ten, twenty, even fifty years hence, can be predicted with a greater degree of assurance than any other economic or social fact, provided the immigration laws are not changed."[18] If this be literally true, it is essentially misleading. Keynes, in his Galton Lecture early in 1937, put it thus:

[17] Bur. Census, "Changes in Marital Status and in Number of Households: 1890 to 1951," Ser. P-20, No. 35, Nov. 28, 1951.

[18] O. E. Baker, "Population Trends in Relation to Land Utilization," *Proceedings Second Internat. Conf. of Agr. Economists* (Menasha, Wis., 1930), p. 284. In an address at McGill University, July 1949, Baker frankly acknowledged the error of this and related convictions that he had earlier expressed.

> . . . perhaps, the most outstanding example of a case where we in fact have a considerable power of seeing into the future is the prospective trend of population. We know much more securely than we know almost any other social or economic factor relating to the future that, in the place of the steady and indeed steeply rising level of population which we have experienced for a great number of decades, we shall be faced in a very short time with a stationary or a declining level. The rate of decline is doubtful, but it is virtually certain that the changeover, compared with what we have been used to, will be substantial. We have this unusual degree of knowledge concerning the future because of the long but definite time-lag in the effects of vital statistics.[19]

Keynes did not specifically limit his observations to the United Kingdom, of which they still seem most nearly true. As generalizations, and specifically for countries as diverse as the United States, Canada, Australia, Japan, and India, they are utterly unsafe.

Two of the persistent errors in this field are: (1) the willingness of the specialists to attempt to comply with urgent requests for estimates or forecasts that cannot be reliably made—many such demands should be resisted; (2) the tendency of users of such estimates and forecasts to ignore the qualifications with which they are hedged. Three other errors have been important in the past three decades. One has been the tendency for those who make estimates based on assumptions to come to put faith in the results, ignoring their own awareness of the basic uncertainties. Another is the tendency to believe in a sort of trend magic; the very term "population trend" is deceptive and dangerous. A third has been a conservative bias in connection with future births, deaths, and net in-migration. Surely it is impressive to find that our population at the beginning of 1952 was higher than had been indicated by the highest projections seriously presented in the whole period 1933-49.

Forecasts of births for any period of years are subject to very wide margins of error. Consequently, forecasts of the total population, which nowadays depend heavily upon the number of births, can be far wrong. In this sense, forecasting births and total population in the United States is impossible, for the present at least, whether for 5, 10, 25, or 50 years ahead. These are new and important truths which many are loath to recognize.

Despite such limitations, there is a field for population forecasting that goes beyond mere multiplication and refinement of projections. First, forecasts of most age groups already born can be made subject only to reasonable margins of error, and for many purposes of important analysis these will suffice. Second, special attention should be

[19] J. M. Keynes, "Some Economic Consequences of a Declining Population," *Eugenics Rev.* (London), Vol XXXIX (Apr., 1937), pp. 13-17.

focused on the size of groups reaching certain ages, such as the common ages of entering the labor force, marrying, child bearing (for women), and ceasing to be full-time members of the labor force.[20]

On the basis of such clear evidence there is now ample reason for rejecting, for the calculable future, the entrenched convictions that our population is approaching a peak from which a decline is more probable than even stability at that level. The grounds on which the former conviction was based have collapsed. No population peak of any size, at any date, is either in sight or safely predictable. If continuation of the rate of growth of 1946-51 seems highly improbable, we have no clear basis for predicting any other. Variations in rate of growth, within and over decades, are far more probable than smooth "trends," mainly because of past and future shifts in the course of births.

The number of deaths per year can be expected to rise in the coming decades, even if the age-adjusted death rate continues its decline. Net in-migration is still unpredictable, but it is no longer safe to assume, as the favored projections of 1938-47 did, that it will be negligible or nil. Short of a catastrophe greater than World War II, however, births will almost certainly continue to exert the dominant influence on our population growth.

Whatever the population may prove to be in 1960 or 1970, there are strong grounds for expecting a new flood of births and a fresh upsurge of population in the 1970's. Most of the girl babies born since 1940 will be bearing children in that decade. More than 96 per cent will presumably survive to age 20. Most of these will marry. The median age at first marriage is now under 21. About half of the children are born before their mothers pass age 26. Such figures are of course subject to change, but there is no present ground for expecting such radical changes in habits, preferences, and social conditions as to dim the prospect of a rise in marriages even before 1970 and an ensuing bulge in births. No really high birth rate—or even rates as high as those of recent years—and no cessation of the persisting downtrend in really large families are implied.

On such a basis, considering that our population passed 156 million early in 1952, in the year 2000 it is likely to be between 200 and 300 million, and an excess over 300 million seems to me as conceivable as

[20] The margin of error in forecasting the size of upper age groups is much larger than has been hitherto realized, even for relatively short periods and much more for several decades ahead. Whelpton's 1947 *Forecasts* (p. 49) indicated 11,306,000 aged 65 and over on April 1, 1950, on the basis of his most favorable assumptions (*I h 200*). The Census reported 12,322,000 in this group, a difference of 1.1 million persons or 9 per cent. The Census Bureau's high projection published Aug. 10, 1950 indicated 11,630,000 in age groups 65 and over, for July 1, 1950. The Census figure for April 1, 1950 was 6 per cent higher. Parts of these differences were presumably due to unexpectedly favorable mortality experience in 1945-50, and perhaps an excess of older immigrants over the number assumed. But Census experts attribute more to exaggeration of ages in the 1950 returns.

a falling short of 200 million. With the reservations mentioned above, indeed, our population in 1980 seems to me more likely to be over 200 million than under it. These "guesstimates" suggest the sort of magnitudes that should now be envisaged instead of the Census Bureau's earlier peak forecast of 165 million and the Pearl-Reed figures of 175 million in the year 1980 and 185 million in the year 2000.

This revised prospect may seem pleasing to some, appalling to others. For better or worse our economic, political, and social problems will be radically different from what the former outlook had led us to expect.

It may still be true "that the rate of population growth in the United States is slowing down,"[21] if one speaks in terms of half-centuries. Few *expect* our population to *double* in 1950-2000 as it did in 1900-50, though this is no longer *inconceivable* even if we do not reopen our doors to heavy immigration. But the probable extent of the slow-down in this half-century now appears far less than demographers—and economists, following them—have considered fairly certain. A net increase of more than 50 per cent in 50 years now seems highly probable; whereas the Census Bureau's forecast of September 15, 1946 implied one of only 12.3 per cent.[22] Expectations before Pearl Harbor had been still more conservative.

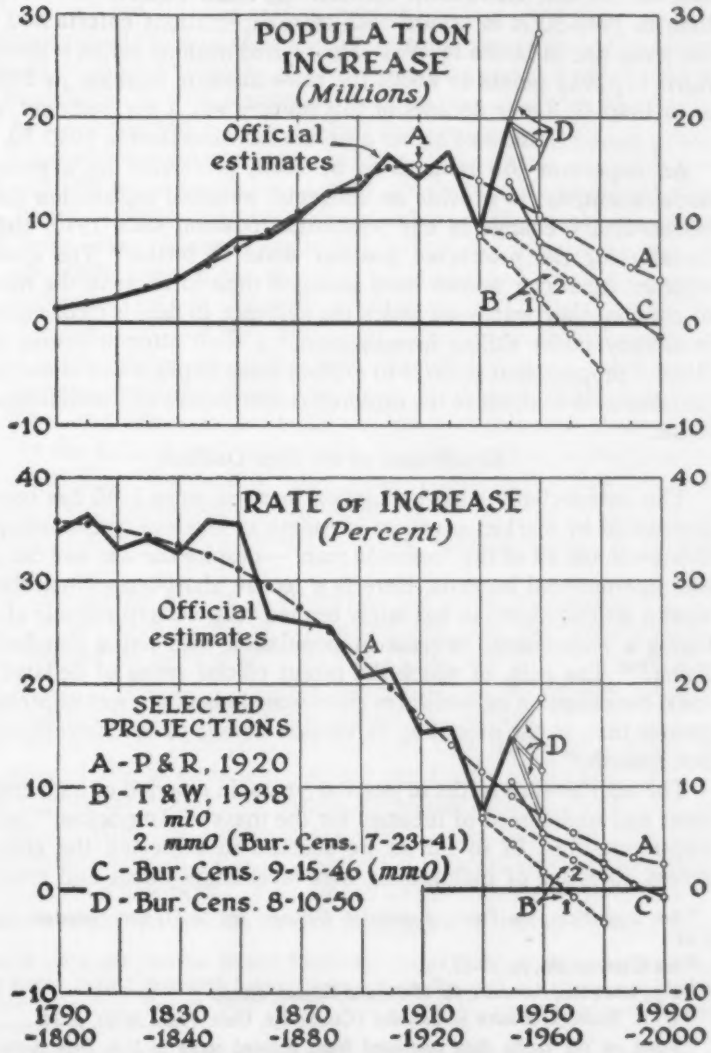
Chart 3 gives some perspective. The upper section shows decennial increases from 1790-1800, and those derived from Pearl and Reed's 1920 logistic curve (A) based on data for 1790-1910 and projected here to the year 2000. This implied a tendency to declining *absolute* increases after 1910-20. In the lower section, showing decennial *rates of increase*, the Pearl-Reed curve has a continuously downward sweep. In mid-1941 the Census Bureau formally accepted similar convictions based on the very different work of Thompson and Whelpton of the Scripps Foundation.[23] It accepted as its forecast the 1938 *m m 0* series (B2), which pointed to declines in absolute and relative increases after 1930. The revised official forecast of mid-September 1946 raised the level of both curves (C), because of unexpected increase in 1940-45, but retained the same convictions. The actual figures for 1950 were out of line with all but the most recent expectations. In mid-1950, the developing evidence led the Census Bureau to make an interim revision, limiting its projections to 1960. The high and low projections were

[21] Dorn, *op. cit.*, p. 331.

[22] This forecast, not yet formally disavowed except for 1950-60, indicated *declines in absolute increases* of population after 1947 until 1990, and *absolute decreases* thereafter. In commenting on this matter in 1947 Whelpton said (*Forecasts*, p. 39): "The outlook after 1950 is for a continuation of the long-time decline in population growth, both in absolute numbers and rate." Pearl and Reed's different forecast (1920) was similar in this respect. See Davis, *Population Upsurge*, pp. 64-73.

[23] Bur. Census, Ser. P-3, No. 15, July 23, 1941.

CHART 3.—UNITED STATES POPULATION INCREASE AND RATES OF INCREASE, ACTUAL AND PROJECTED, DECENNIALLY, 1790-2000[a]



[a] Based on latest revised official estimates of population, and projections indicated in footnote 6 except as follows: *P & R 1920* figures are from Lowell J. Reed, "Population Growth and Forecasts," *Annals*, Nov. 1936, p. 163.

frankly extremes, and the medium one was not stressed (D). The fact that the medium shows lower absolute and relative increases in 1950-60 than in 1940-50 is in accord with most expectations entertained until the fresh rise in births in 1951. The revised medium series released on April 17, 1952 points to about the same absolute increase in 1950-60 as in 1940-50. Later decades of this century will, I am confident, show one or more instances of higher absolute increases than in 1940-50.

An important job remains to be done, preferably by a group of social scientists: to provide an adequate, weighted explanation for the extraordinary change in our population position since 1940, and especially for the protracted postwar flood of births.[24] The question whether American women have changed their ideas as to the number of children they want—on which the evidence to date is inconclusive—is already under skilled investigation.[25] I shall attempt neither task. What I propose next to do is to explore some implications of our rising population in contrast to the explored consequences of a declining population.[26]

Significance of the New Outlook

The unexpectedly large population increase since 1940 has been accompanied by marked advances in American levels of consumption and living—in the lot of the "common man"—despite the war and our postwar international burdens. Here is a recent, short-term illustration of what a British historian has lately termed "the western miracle of combining a phenomenal increase of population with rising standards of living."[27] The gain, of which the recent official series of deflated personal consumption expenditures gives some indication, was impressively greater than in the preceding depression decade of our slowest population growth.[28]

The high level of births in postwar years, in a period of high employment and undreamed-of incomes for the mass of Americans,[29] raises a major question. In so far as we succeed in achieving the generally agreed objective of maintaining high-level employment and gradually

[24] For suggestions, see Davis, *Population Upsurge*, pp. 56-57, and Notestein, *op. cit.*, p. 34.

[25] See Kiser, *op. cit.*, pp. 25-37.

[26] *E.g.*, Whelpton, *Forecasts*, pp. 55-72, and Keynes, *op. cit.*

[27] W. K. Hancock, *Wealth of Colonies* (Cambridge, Univ. Press, 1950), p. 34.

[28] Based on per capita data computed from deflated series in U.S. Dept. Commerce, *Survey of Current Business*, Suppl., *National Income, 1951 Edition*, p. 146.

[29] According to one well-known index, American industrial activity has been above its estimated long-term growth trend in all but five scattered months since the end of 1940, whereas from early in 1930 until late in 1940 industrial activity was continuously below its growth trend except for the first half of 1937. Such a protracted period of active business, with the accompaniments of high-level employment, output, and income, has undoubtedly had important influence on marriages and births.

rising incomes per capita, will this continue to promote marriages, births, and relatively large population increase? It is surely reasonable to think so,[30] but this has seldom received serious attention.

Marriage and children constitute an integral part of the real standard of living of most Americans. Under economic pressure, either or both will be deferred and the number of children restricted. But if economic and social conditions permit gradual increase in consumption levels and improvements in working conditions, the gains from higher productivity will be taken, on the average, partly in more goods and services, better housing, shorter hours of labor, earlier marriage, somewhat more living children per family, and greater ease in old age. No one can safely forecast the changing proportions to which such gains will be devoted, or how seriously our international obligations will restrict the net total. But the evidence of recent years strongly suggests that if goods become obtainable with less and less effort, the competition between wants for goods and wants for babies, which depressed marriages and births in 1925-40, will be less powerful than it was then. In the light of such experience, we must beware of exaggerating limitations upon the facility with which consumption *standards*—as distinct from consumption levels—can rise or be raised. Much more research is needed before one can speak with assurance of specific limits.[31]

Our educational system is already in the throes of coping with the results of the flood of births during and since the war. School enrollment reached its prewar peak in the 1930's—in elementary schools early in the decade, in secondary schools late in the decade. Demographers late in the 1930's expected a continuing decline.

As late as 1944, Thompson considered it very doubtful whether the then assured rise in elementary school enrollment would ever bring it up to the prewar peak (23.6 million, including kindergarten pupils, in 1929-30).[32] After the slump in the 1940's, this peak has now been exceeded, probably in 1950-51. Office of Education specialists early in 1950 forecast a new peak (29.5 million) 25 per cent higher in 1956-57.[33] But the unexpected continuance of high levels of births through 1951

[30] For a concurrent view see Harold Wool (Bur. Labor Stat.), "Long-term Projections of the Labor Force," presented before Conference on Research in Income and Wealth, Nat. Bur. Econ. Res., May 25, 1951, pp. 5-7. Wool extends the argument to mortality and immigration.

[31] For the United States I strongly reject Keynes' 1937 opinion as to Great Britain (*op. cit.*): "Now past experience shows that a greater cumulative increment than 1 percent per annum in the standard of life has seldom proved practicable. Even if the fertility of invention would permit more, we cannot easily adjust ourselves to a greater rate of change than this involves."

[32] W. S. Thompson, *Plenty of People* (Lancaster, Pa., Cattell, 1944), p. 156.

[33] *School Life* (U. S. Office of Education), Vol. XXXII (March, 1950), pp. 88-89.

insures that the peak will be higher and at least four years later—how much higher and later no one can really say. It now seems safe to say, nevertheless, that enrollment in elementary schools around 1960 will exceed 30 million, 50 per cent above the low of the mid-1940's. This is a very striking change.

Enrollment in secondary schools, still depressed by the low births in the 1930's, has recently begun to rise. It will presumably pass the 1939-40 peak (7.1 million)[34] about 1956-57 and continue upward through most of the 1960's.

Total school enrollment will surely not reach its peak in the 1950's, as earlier forecasts implied, but in the 1960's; and this peak will presumably be nearer to 40 million than the 37.2 million recently forecast by the Office of Education for 1957-58. Any such maximum, moreover, will presumably be exceeded in the 1980's.

The urgent demand for more schools, facilities, and teachers is not confined to areas of exceptional population growth, such as the West Coast states and Florida, but is a national phenomenon. It reflects the joint influences of unexpectedly larger numbers, pressure for fuller coverage of children, and improvements in quality of education, which our highly productive economy can well afford even though these present difficult fiscal problems.

The population of college age will be in a trough for several years more, but will rise after 1957 and sharply after 1963 for at least five years. The actual college population, of course, is heavily influenced by the proportion of those of college age who attend college. Though veterans enrolled under the "GI Bill" exceptionally swelled the postwar college ranks,[35] there is yet no sign that the broad uptrend in this proportion will taper off.

We are now in a period when the number of young entrants into the labor force (on the average at 18) will be lower than in the recent past or in the 1960's and after. This, together with considerable enlargement of our military forces, largely accounts for the current shortage of labor in the face of the rearmament program and, in turn, for exceptional advances in levels of real wages. In such a period, premiums will be put on the retention of older workers, the rehabilitation of the physically disabled,[36] and the attraction of younger and older women

[34] *Ibid.* The source next cited gives 7.7 million persons 14-17 enrolled in school in April 1940, but some of these were presumably in elementary grades.

[35] In April 1950, according to preliminary census reports, 18.6 per cent of those aged 18-24 were "enrolled in school," as compared with 13.3 per cent in 1940. Bur. Census, Ser. PC-7, No. 1, Feb. 25, 1951.

[36] In the past two decades, striking advances in medico-sociological science have given promise that the majority of physically handicapped or disabled children and adults can be restored to independent positions within a normal community. The United Nations has

into the labor force. We can now envisage a very different situation in the 1960's, when the number of persons reaching 18 will rise greatly. Extension of schooling will presumably proceed under handicaps in the 1950's but with greater ease later. Older persons will then presumably find it much more difficult to hold jobs or get new ones, including part-time work. The 1950's now promise to be a period in which hours of labor will tend to be well maintained, whereas in the 1960's they should normally decline.

The number of boys reaching military age has been falling for nearly a decade, primarily because of the fall in births in 1924-33 but at a much slower rate because of marked reductions in infant, child, and youth mortality. From a low point in 1951, the number of boys reaching 18 will rise, at first slowly and then more sharply, to an interim peak in 1965 (roughly 1,800,000) reflecting about 2 million births in the 12 months ending August 1947. This peak will probably be 70-75 per cent above the number subject to draft registration in 1951. The corresponding number will probably be slightly higher in 1969, and only moderately lower in the intervening years. The course beyond 1969 will depend upon births after 1951, which, though now unpredictable, seem likely to be more or less below recent levels for the next few years.

The unprecedented number of births since 1942, and the marked decline in mortality of infants, children, youths, and adults through middle age, presage a swelling of the population of ages 18-64 in the next 20 years at least. The Census Bureau's 1950 medium projection points to an increase from 82.4 to 98.4 million in age groups 18-64 between 1940 and 1960. The actual increase will presumably be greater, rather than less, than the 20 per cent implied. This increase is significant for forecasts of the labor force, which is drawn most heavily from these age groups. No trend peak in the labor force is yet in prospect, as had seemed to be the case before the postwar flood of babies.[37] By the year 2000 the labor force will presumably be far higher than now.

Demographers have been right in forecasting rapid growth of the population aged 65 and over, as a by-product of improved mortality experience including that in the upper ages. Indeed, the actual increase has been and will be larger than they have predicted. But this has less grave significance than has commonly been attributed to it. Along with increasing longevity has come an appreciable extension of physical and

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recently set up a Rehabilitation Unit in its Department of Social Affairs, and various important steps are being taken to speed the progress in applying new techniques. See UN, *TAA Bulletin*, July 1951.

[37] Durand had said, on the basis of forecasts standing in 1946-57: "Unless the underlying population trend is changed the time will come after a few more decades when the labor force will cease to grow." J. D. Durand, *The Labor Force in the United States, 1890-1960* (New York, Soc. Sci. Research Council, 1948), pp. 21-22.

mental vigor. Occupational changes are tending to put higher premiums on mental skills than on physical powers. Hence the ability of older persons to support themselves in the upper ages, in whole or in part, has been increased, whether the support is earned through employment or by self-service or mutual service. Furthermore, so long as employment is at a high level, as it has been for a decade, the pressure to replace older by younger workers is less than when unemployment is serious. There are increasing recognitions of the value of older workers and of the economic and psychological desirability of facilitating the use of their reserves of earning power. Moreover, with the spread of social-security and pension arrangements, and personal investments of various kinds including owned homes, an increasing proportion of oldsters will have earned claims to income in their declining years. Finally, in so far as the burden of supporting the elderly and aged falls on younger generations or on taxpayers generally, there will be many more to share this burden than seemed likely only a few years ago.

Demographic developments in process promise marked changes in the relative population and manpower of prominent nations. The United States in 1900 had a population less than twice as large as the United Kingdom's. In 1950 it was three times as large, and by 1975 it may be about four times as large, as the United Kingdom's. As in the past 50 years, so in the next 50, Canada and Australia will gain on the mother country. In 1901 the United Kingdom had a population 4½ times the combined population of these two overseas offshoots. Early in 1951 the ratio was 2.3:1. By 1975 it will be down to 1.5:1, if one can trust current assumptions that the British population will grow but little in the next 25 years, net, if it does not actually decline,[38] and that the populations of Canada and Australia will, as in recent decades, grow at a rate faster than that of the United States. The basis for present and future comparisons of the United States and USSR is lacking, since vital statistics and other demographic data are only sporadically and inadequately revealed by the Soviet Union.[39]

Leading demographers have drawn the major inference, from their analyses and extrapolations, that the combined populations of the more advanced nations, and of the United States and Canada, in particular, will in future constitute a declining fraction of the world's population

[38] This is the prospect held out by the June 1949 report of the Royal Commission on Population, Cmd. 7695. Recent census data show that the rate of population increase there has been 4-5 per cent per decade in the past three decades, following seven decades (1841-1911) in which the decennial rate ranged between 10 and 15 per cent. *Economist*, July 14, 1951, p. 78.

[39] Harry Schwartz recently (*New York Times*, Nov. 11, 1951) summarized Soviet official information indicating, for the present territory of the USSR, populations of 193 million in 1940, 201 million early in 1950, and 207 million late in 1951. L. P. Beria of the Politburo said that the Soviet population is increasing at the rate of 1¾ per cent per year.

instead of the rising fraction characteristic of the past three centuries.[40] In view of the international disparities in per capita resources and levels of living, such a development would seem highly irrational, and tragic even for the underdeveloped countries. The inference merits critical re-examination, now that the population outlook in North America has radically changed. It may be that the combined populations of the USSR and its satellites, the Middle East, Asia, Africa, and Latin America will grow in the next half-century at a much more rapid rate than they have in the past 50 years. Considering the many obstacles that they face, however, it is not easy to see how these peoples can expand so fast that the world population (including that of Western Europe) will grow as rapidly as can now be expected of the United States and Canada, with their still developing human and natural resources, their economic strength of other kinds, and the re-interpretation of their "population trends." I lean to the "guesstimate" that these two countries will have something like 8 per cent of the world's population in 2000, as compared with about 7 per cent now; but the state of population forecasting justifies no confidence in this or other "estimates."

In three earlier papers[41] I have stressed the increase in the demand for farm products due to the population upsurge since 1940, the further increase that can be counted upon as children now under 12 grow older, and the radical improvement in the prospects for American agriculture in the decades ahead as compared with the outlook as it appeared five years ago.[42] The latest data on births strengthen these prospects.

[40] See, for example, F. W. Notestein, "Population—the Long View," in T. W. Schultz, ed., *Food for the World* (Univ. Chicago Press, 1945), pp. 36-57. Kingsley Davis, relying mainly on Carr-Saunders' estimates, found the following average annual rates of increase of the world population (*Annals Am. Acad. Pol. and Soc. Sci.*, Vol. 237 [Jan., 1945], p. 3:

Period	*Per Cent*
1650-1750	0.29
1750-1800	0.44
1800-1850	0.51
1850-1900	0.63
1900-1940	0.75

Irene B. Taeuber asserted in 1944: "America North of the Rio Grande included 0.2 per cent of the world's population in 1650, 6.7 per cent in 1933." (*Estadistica*, Sept. 1944, Vol. II, p. 324).

[41] Those of November 1949 and January and April 1950, cited in footnote 4.

[42] Hardly less impressive is the concurrent decline in the number of people on farms. According to recently revised estimates, the farm population was 32.1 million in April 1910. By 1930 it had fallen to 29.4 million. After a rise during the depression, it declined to 28.8 million in 1941. The 1951 figure of 23.3 million represents 15 per cent of the total population, as compared with nearly 35 per cent in 1910. The drop of 5.5 million in the past decade is very large. The 1951 figure is 1.1 million below the wartime low of 1945. (Bur. Census, Ser. Census-BAE, Nos. 16A, 17, July 18 and Oct. 26, 1951).

Even more striking is the extreme reversal of prospects for new investment, on which the American economy has heavily depended in the past. Cannan wrote in 1931:

> A rapidly increasing population requires a rapidly increasing number of tools, machines, ships, houses and other articles of material equipment in order merely to maintain without improving its economic condition, while at the same time the maintenance of a larger proportion of children renders it more difficult to make the required additions. To a stationary population saving will still be desirable for the improvement of conditions, but it need no longer be insisted on as necessary for the mere maintenance of the existing standard.[43]

Keynes, Hansen, and others elaborated these views. One of the strongest pillars of Hansen's doctrines of "secular stagnation" and the "mature economy" was that our population growth would shortly come to an end. The Royal Commission on Population was rightly concerned with this matter in the United Kingdom. But Hansen's pillar has collapsed, so far as the United States is concerned, for our population growth prospects are totally different from what he accepted as certain. Huge private and public investments will be required to cover the requirements of a population growing at a considerable (if not extremely rapid) rate,[44] with unprecedented numbers in April 1952 under 5, 10, and 15 years of age,[45] and with rising consumption standards in food, housing, and recreation. For the time, defense requirements are compelling diversion of investment, and arrears are building up as during the war, though on a smaller scale.

Failure of investment demand was feared as a source of severe economic difficulties in the United States, including chronic large-scale unemployment and huge government spending to keep up aggregate demand. By contrast, our postwar problem has been one of *excessive* demand, making for inflation, and our population growth coupled with our world responsibilities bid fair to make this the more serious problem in the present decade.

The surprising recent population growth has been a major factor,

[43] Edwin Cannan, "The Changed Outlook in Regard to Population, 1831-1931," *Econ. Jour.*, Vol. XLI (Dec., 1931), pp. 519-33, esp. p. 524.

[44] By far the lowest decennial increase in our history was in 1930-40. Even at that average annual rate (.71 per cent), our population would double in a little over 100 years. The rate of increase in 1940-50 was nearly double this (1.40). It is now conservative to expect for 1950-2000 an average annual rate somewhere between these two. In the five years ending June 1951 the rate of increase averaged 1.73 per cent. See also data in footnote 40.

[45] Census data for 1850-1950 are conveniently summarized in Metropolitan Life Ins. Co., *Stat. Bull.*, Jan. 1952, p. 8. Corresponding numbers in April 1952 were certainly considerably higher.

reinforced by higher real-income levels and moderate hours of labor, in expanding public and private investment since the war in roads, water and sewerage systems, gas, electricity, and telephone lines, private manufacturing plants, transportation equipment, housing, and private automobiles.[46] The rearmament program is distorting and on the whole restricting such investments for the present; but the maturing of the huge group of persons now under 20, which can be reasonably forecast, gives reason to expect strong continuing demands for such investment after arrears due to wartime restrictions and the current defense program are made up.

The notable postwar demand for new housing rests not only upon wartime arrears that had to be made up and on federal and state aid by easy credit. It also reflects the population increase, the higher percentage of married as compared to single persons, higher living standards in respect to independent quarters, higher real incomes, and greatly enlarged holdings of liquid assets. The mere growth of the postwar babies will tend to increase the demand for housing space. Though many of the new houses will not be long-lived, a large proportion of them are provided with modern conveniences so dear to American hearts, and their depreciation and obsolescence will eventually provide fresh impetus for further building. Increasing fractions of our people, moreover, now feel that they can afford week-end and summer residences, even if these are no more than cabins or tents.

Certain investment requirements will presumably be intensified by the more striking population growth. Economists have tended to speak of water as a "free good." In advanced economies, at least, and even in many backward economies, it is not such in reality. Indeed, water is one of the goods for which industrialization, urbanization, and modern agriculture raise per capita needs many-fold. To insure ample sup-

[46] Reed in 1925 worked out a formula by which he forecast the number of registered passenger cars for 25 years ahead, which he combined with the population forecast based on the Pearl-Reed formula of 1920 (L. J. Reed. "A Form of Saturation Curve," *Jour. Am. Stat. Assn.*, Vol. XX [Sept., 1925], pp. 390-96). Following are his figures for Jan. 1, 1950, together with the ultimate limits ("upper asymptotes") indicated by the formulas, compared with actual figures for Jan. 1, 1950 and 1951:

Item	*Population*	*Passenger cars*	*Persons per car*
Upper asymptote	197,274,000	38,636,000	5.11
Jan. 1, 1950			
Pearl-Reed '20	148,676,000	28,416,000	5.23
Actual	150,563,000	36,293,000	4.15
Jan. 1, 1951			
Actual	153,085,000	40,167,000	3.81

As Rufus S. Tucker has pointed out to me, the number of cars in use at the turn of the year is considerably smaller than the cumulative registrations in the year then ended. Nowadays the difference is around 10 per cent.

plies of water where and when they are wanted for production and consumption, and to replenish depleted reserves of ground water, will entail expensive engineering constructions. The population increase now clearly in prospect necessitates radical upward revisions of earlier forecasts of water requirements and radical evolution of our national water policies, both because the population is sure to be much higher than earlier forecasts and because rising levels of living raise per capita water use. The 1950 report of the President's Water Resources Policy Commission takes due cognizance of this.

The foregoing discussion is suggestive, not exhaustive. Many other aspects of the significance of our radically altered population outlook will be revealed to individual specialists as they re-examine their specialties in the light of up-to-date demographic data, and keep on doing so. We must unlearn much of what the demographers have too well taught us, realize the unsound bases for many past assumptions, and view their latest projections and assertions with highly skeptical eyes. We face an extremely different nation from the one they had led us to expect with assurance, and must make the best of its unpredictability where we had thought it most predictable.

Space does not permit grappling with the many questions that arise at this point. Will even urgent wants be made effective by adequate purchasing power? Can such growing demands for food, water, consumer durables, houses, and plant be met? Are not our resources steadily dwindling? Will not the population growth now fairly in prospect force declines in per capita consumption? Can our political system stand the strains of further noteworthy population increase?

Questions of this kind are highly pertinent for the coming decades. Our success in virtually creating resources by discovery and otherwise, our remarkable technical improvements in agriculture, the demonstrated growth of productivity, almost throughout the economy, and the rise in consumption levels despite war, international burdens, and population increase, certainly suggest no grounds for despair. Indeed, by and large, the problems of a highly dynamic economy seem more appealing and less baffling to Americans than those of a stable population and possibly stagnating economy.

[Paper by David White, Chief Geologist, United States Geological Survey, before the annual meeting of the Society of Automotive Engineers, February 4–9, 1919]

"The Unmined Supply of Petroleum in the United States"[1]

"The justification of an estimate so highly speculative as must be that of the petroleum resources in the ground in the United States lies in the widening angle between the flattening curve of production and the rising curve of consumption. The standards of living, the industrial power, and the prosperity of the country are dependent to so great a degree upon our oil supply, and the question of the adequacy and duration of this supply so directly concerns, at the present moment, the individual citizen as well as the public in general, that an estimate, even if it is but a scientific guess, based, with careful study, experience, and judgment on the best information available, is imperatively necessary.

"In response to the growing interest of the public four estimates of the oil resources of the United States have been made. In 1908 Dr. David T. Day,[2] then in charge of petroleum statistics in the United States Geological Survey, calculated the total amount of oil originally available in the ground as ranging somewhere between a minimum of 10 billion and a maximum of 24,500 million barrels. In 1915 Dr. Ralph Arnold[3] placed the original supply of oil at 9,098,557,000 barrels, of which he believed 5,763,100,000 barrels remained in the ground at the end of 1914. The third estimate was made by the geologists of the oil and gas section of the Geological Survey for the use of the Secretary of the Interior in responding to a Senate resolution of January 5, 1916, and was published in Senate Document 310, 64th Congress, 1st session, February 2, 1916. According to this estimate the reserve of oil available at the end of 1915 was 7,629 million barrels. In the spring of 1917 the production records and the possible oil regions were closely reconsidered with marked conservatism by the same geologists, each studying the regions with which he had field acquaintance, with the result that the total oil available in the ground at that time was estimated at 6,182 million barrels.

"In the preparation of estimates by the United States Geological Survey consideration has been given to the general character of the geologic formations—stratigraphy, geologic history, structure—the number, thickness, continuity, and pore space of sands, the curves of production, the gas pressure, the water relations, and the results of drilling in nearby or geologically similar regions. A large part of the producing or possibly productive area in the Western States has been examined and mapped by the oil and gas geologists of the Survey or is now under examination. Typical areas in the Central, Gulf, and Eastern States have also been studied. Nevertheless, the criteria upon which estimates can be based vary in every degree of inadequacy in the different regions, and the quality of the results, therefore, varies with the extent and character of the data available and with the personal equation of the estimators. Necessarily the estimates for areas not yet tested, especially those remote from the producing fields, are based upon theoretical conditions, carefully considered. For most of the areas estimates were first formulated by the geologists who had studied the areas. Later, these estimates were discussed in conferences.

"*Recent geologic investigations.*—Further recent geologic investigations in the field and the study of the results of testing and exploration, especially in the Rocky Mountain and Gulf States, have furnished the basis for a more reliable recalculation of the estimates for a number of the regions. The conclusion reached is that the available oil in the ground at the end of 1918 approximates 6,710 million barrels.

"The new estimates, combined according to the commercial fields, are given in the accompanying table, in which for comparison and information are shown the marketed production for 1917 and the estimated output for 1918, as compiled by John D. Northrop, of the Geological Survey, in charge of statistics of petroleum and natural gas, and the approximate total production of petroleum in the United States to the end of 1918, also based on Geological Survey records. For the immediate convenience of the reader there is also included the percentages of average gasoline recovery from the oils of the different fields at the present time. For the latter data the writer is indebted to Chester Naramore of the Bureau of Mines, in which Bureau the returns of gasoline recovery from the oil runs are compiled. The general characteristics of the various crude oils in

[1] By David White, chief geologist, U. S. Geological Survey. Published by permission of the Director of the U. S. Geological Survey.
[2] U. S. Geological Survey Bulletin, No. 394, p. 30, 1909.
[3] Economic Geology, vol. 10, No. 8, p. 695, December 1915.

the different fields are too well known to require discussion in this paper, and their especial qualities will be fully considered in those to follow. It will, however, be noted that the reserves of the heavy oils of California and the gulf coast are estimated at about 3 billion barrels. Probably such low-gasoline oils comprise more than one-half of the total reserves. [When this article was written cracking processes were of little importance. The low-gasoline oils which Dr. White mentions can yield high-octane gasoline with today's refinery techniques. This is another case where forecasting is impossible as new techniques completely alter the picture.]

"Those who have followed the history of petroleum in America and understand how much of our present-day oilfield development has taken place since Day made his estimates in 1908, and even since Arnold calculated the reserves in 1915, will appreciate the great advantages, mainly in the form of results of exploration and records of production, enjoyed by those who make computations now. However, with these circumstances in mind, we may, nevertheless, for comparison, compensate and bring to date the earlier estimates by deducting subsequent production to the end of 1918. The available oil in the ground at present would be according to these estimates, as follows:

"Day (estimate in 1908), 5,402 million to 19,902 million barrels.

"Arnold (estimate in 1915), 4,500 million barrels.

"Geological Survey (estimate in 1916), 6,647 million barrels.

"Geological Survey (estimate in January 1919), 6,740 million barrels.

"The recent estimate by the Geological Survey, as given above, and as differentiated by fields in the accompanying table, differs from that of 1916 mainly in a more conservative view as to prospects in Montana and recoveries along the gulf coast and in a more optimistic attitude toward Kansas and the States of little or no present production. As compared with the very conservative estimate formulated in the Geological Survey in 1917 they represent greater confidence in Wyoming, north Texas, and Alaska, and several of the minor States. In general, they are to be regarded as conservative, and there is little probability that the actual yield will fall short of the calculated amounts. They are, however, likely to be again revised in the near future, as the modes of occurrence of oil and gas in different regions become more fully understood, as exploration proceeds, and as the areas offering possibilities of oil discoveries are examined more in detail.

Available oil remaining in grounds, as estimated by the U. S. Geological Survey

[Barrels of 42 gallons]

Oilfields	Marketed production in 1917	Marketed production in 1918 (preliminary (estimate)	Total marketed production to end of 1918	Available oil left in ground, January 1919	Present average gasoline extraction (percent)
Appalachian	24, 932, 205	25, 300, 000	1, 221, 737, 000	550, 000, 000	28.0
Lima, Ind	3, 670, 293	3, 100, 000	448, 404, 000	40, 000, 000	20.0
Illinois	15, 776, 860	13, 300, 000	298, 159, 000	175, 000, 000	22.0
Mid-Continent	144, 043, 596	139, 600, 000	990, 573, 000	1, 725, 000, 000	24.0
North Texas	10, 900, 646	15, 600, 000	78, 971, 000	400, 000, 000	33.0
North Louisiana	8, 561, 963	13, 000, 000	90, 902, 000	100, 000, 000	28.0
Gulf	24, 342, 879	21, 700, 000	303, 954, 000	750, 000, 000	1.5
Wyoming	8, 978, 680	12, 370, 000	39, 793, 000	400, 000, 000	40.0–50.0
California	93, 877, 549	101, 300, 000	1, 114, 000, 000	2, 250, 000, 000	12.0
Alaska, Colorado, Michigan, Montana, etc	230, 930	230, 000	10, 651, 000	350, 000, 000	----------
Total	335, 315, 601	345, 500, 000	4, 598, 144, 000	6, 740, 000, 000	----------

"The reports of production of petroleum in the United States, as compiled by the Division of Mineral Resources of the Geological Survey show that since 1858 approximately 4,598 million barrels of petroleum have been taken from the ground. This is more than two-thirds as much as the amount which according to the latest estimate by the Geological Survey remains available, and exceeds what would now be left according to Arnold. Further, the oil companies are now taking out over one-third of a billion barrels a year.

"*Relation of production and consumption.*—The situation as to petroleum production and the importance of the remaining oil resources of the United States are both graphically indicated by the curves in figure 6. The most significant features here shown are the steep ascent of the consumption curve and

the flattening in 1918, of the curve of actual production in spite of the vigorous efforts of the oil companies to increase their wartime output even at the expense of their proved reserves. To fill the gap between our actual domestic production and the requirements of domestic consumption it has been necessary to reduce the oil in storage to the extent of 27 million barrels and to supplement this with a net importation of 31 million barrels, chiefly from Mexico. The deficiency of our current production during 1918 has, therefore, amounted to 58 million barrels, nearly half of which has been withdrawn from storage. That is to say, this country has to the extent of 27 million barrels of storage oil been 'living on its hump,' which is now reduced to about 123 million barrels.

"According to general expectations, barring disaster or shortage of supply, or much higher prices which might result from such shortage, the consumption curve is destined during the next year, and probably longer, to continue its present general trend beyond the 400 million-barrel mark, which it nearly reached (397 million barrels) in 1918. On the other hand, whether the domestic production can be increased in volume to correspond to the consumption remains to be seen. Glenn pools and Cushings may await discovery, but the strike of a Glenn pool such as produced the bulge in the storage curve for 1907 and 1908, or of new Healdtons and Cushings, such as were largely responsible for the production swell of 1914–15, will make a less conspicuous wave in the greatly expanded and diffused production of today. Texas, the Osage country, and Wyoming will furnish notable contributions, but so many fields are now running down that it will require numerous successive strikes of large magnitude to send the production curve so high that oil will go into storage without considerably increased importations. On the whole, even with prices stimulating the driller to greater efforts, it seems unlikely that the domestic production of petroleum can at best gain appreciably on the reasonably expected increase in consumption. It seems more probable that, unless consumption is restrained by high costs, the gap between consumption and production will continue to widen. In any event, this gap must be filled with oil from other sources. Further exhaustion of stocks in 1919 is a certainty that can be successfully minimized only by still larger importations.

"The situation demands not only the prevention of waste, but the most economical and efficient use of our oil. Also, it warns operators to consider more thoughtfully and promptly the acquisition of foreign oil reserves. Mexico, to which the American public looks with optimistically hopeful eyes, probably contains less oil—perhaps very much less—than remains in the ground in the United States.

"How long the commercial production of natural petroleum will continue in this country is a question whose answer is no less speculative than the quantitative estimates. After the production peak is passed, be it 1 year or 7, the annual output of natural oil will decline gradually for a long time. Oil wells will be producing at least 75 years hence. The pools cannot all be so soon discovered; the oil cannot immediately be got out of the ground. The discovery of deep sands is likely to give new life to many old or even abandoned fields. Pools will be found after prolonged search and repeated wildcatting in old as well as new regions, and this is probably especially true of the gulf coast, where unless geologic discovery and consequent new methods of search come to the aid of the driller, it may be 75 years before some of the productive salt domes are revealed.

"The most significant feature of the prospect, however, is the probability that, although an estimated two-thirds of our reserve is still in the ground, with an annual drain of one-third of a billion barrels, the peak of production will soon be passed—possibly within 3 years. The date when the peak will be reached is a matter of individual opinion, in which predictions have wide range. There are many well-informed geologists and engineers who believe the peak in the production of natural petroleum in this country will be reached by 1921 and who present impressive evidence that it may come even before 1920.

"*Development of oil shale.*—In her deposits of oil shale the United States has an anchor to windward. Oil shale is a richly bituminous shale, some of it approaching cannel in character, interbedded, like coal, in series of shales, sandstones, and limestones. The most extensive and valuable deposits known in America if not in the whole world are in northwestern Colorado, northeastern Utah, and southwestern Wyoming, mainly in what is known as the Uinta Basin. Rich beds of oil shale also occur in very limited areas in northeastern Nevada. Minor deposits, more conveniently located but for the most part leaner and less promising, are found in the Mississippi Valley and the Appalachian States.

D. E. Winchester [4] and A. R. Schultz, of the Geological Survey, have estimated that there are in Colorado, Utah, Wyoming, and Nevada deposits of oil shale in thicknesses of 3 feet or more, and capable of yielding 25 gallons or more of oil per ton, sufficient to produce at least 75 billion barrels of oil.

"The oil is generated through the destructive distillation of the shale, and its character and composition depend largely on the processes employed. Rough dry or steam distillation tests produce distillates—essentially heavy petroleums—carrying both paraffin and asphalt with considerable nitrogen and yielding gasoline in an average of about 12 percent. These rough tests indicate that the gasoline obtainable by distillation of these shales, even by simple methods, far exceeds in amount all the petroleum yet produced in the United States and may equal the remaining natural oil.

"The production of oil from these shales is still in the experimental stage, in which various methods are being tested. Much doubtless depends on the processes devised and adopted. It is possible that initial commercial success may be determined as much by a study of methods and of the possible byproducts and their values as by a further advance in oil prices. The technologic problems connected with the utilization of the oil shales are worthy of research by the best hydrocarbon engineers and chemists.

"Shale oil is the most natural, satisfactory, and ample substitute for petroleum, and it is likely to come into the market as the production curve of the natural oil glides downward beyond the peak, if not sooner. It must be borne in mind, however, that in spite of the probable very rapid growth of the shale-oil industry beginning with the day that shale oil is produced profitably on a commercial scale, it will require several years to construct and put into operation the enormous plants necessary to treat the millions of tons of shale which must be distilled in order to offset the waning production of natural oil, or fill a part of the gap between the production and consumption of petroleum in the United States." (See fig. 6.[5])

According to the United States Geological Survey, the average yield per well per day was 3.3 barrels in 1909; 3.7 barrels in 1910, 1911, and 1912; 3.9 barrels in 1913; 4.1 barrels in 1914; and 4.2 barrels in 1915.

Describing the gas fields of the United States in 1890, Mr. Weeks remarks: "In a general way it may be said that natural gas has been found in varying quantities all through the territory from the Hudson River on the east to California on the west. In Alabama, California, Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Lousiana, Missouri, New York Ohio, Pennsylvania, South Dakota, Tennessee, Utah, West Virginia, Wisconsin and Wyoming, its existence is reported. In some of these States, however, it has not been found in commercial quantities. * * * In 1889 gas in commercial quantities was reported as having been produced in Arkansas, California, Illinois, Indiana, Kansas, Kentucky, Michigan, Missouri, New York, Ohio, Pennsylvania, South Dakota, Texas, and Utah. At the present time the important gas fields are those of western Pennsylvania, eastern-central Indiana, western New York, and northwestern Ohio. * * * The most important gas fields in these territories are those in the gas district in Pennsylvania, in the neighbourhood of Pittsburgh."

[The Department of the Interior has been urging immediate shale-oil development for 30 years. Secretary of the Interior Chapman and the Paley Commission are making no new contribution in their 1953 proposals.]

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[4] U. S. Geological Survey Bulletin, No. 641–F, 1917; Bulletin, No. 691–B, 1918.
[5] Not printed.

VOLUME 1

FOUNDATIONS FOR GROWTH

CHAPTER I. MATERIALS AND FREEDOM

This chapter discusses our dependence on materials and shows that a machine-age civilization rests upon a material base. This section of the report, like so much of the rest of the report, shows the confusion of the staff in both attempting to justify and condemn the price system. For example, page 1 of this chapter contains this statement:

"Today, throughout the industrial world, but centering inevitably in the heavily industrialized United States, the resulting materials problem bears down with considerable severity. The nature of the problem can perhaps be successfully oversimplified by saying that the consumption of almost all materials is expanding at compound rates and is thus pressing harder and harder against resources which, whatever else they may be doing, are not similarly expanding. This materials problem is thus not the kind of 'shortage' problem, local and transient, which in the past has found its solution in price changes which have brought supply and demand back into balance. The terms of the materials problem we face today are larger and more pervasive."

There is no evidence that the price mechanism will not bring supply and demand back into balance today as it has in the past. This is just an unsupported statement.

Page 3 states the general convictions held by the members of the President's Materials Policy Commission. These beliefs are:

1. The Commission believes in growth. (Comment: This belief is in keeping with the tradition of American competitive enterprise.)

2. The Commission believes in private enterprise as the most efficacious way of performing industrial tasks in the United States. (Comment: This, too, is a good statement.)

3. The Commission believes that the destines of the United States and the rest of the free non-Communist world are inextricably bound together.

The Commission continues with the statement that "if the United States is to increase its imports of materials it must return in other forms strength for strength to match what it receives." Normally both the buyer and seller in a free market believe that they have made a good bargain. If they do not, the transaction would not take place. The Commission's statement implies that we must do something more, in fact, the Commission continues with the statement:

"If we fail to work for a rise in the standard of living of the rest of the free world, we thereby hamper and impede the further rise of our own, and equally lessen the chances of democracy to prosper and peace to reign the world over."

Again, there is no question that rising standards of living throughout the free world are desirable. There is a question whether we can raise the standards of living of other countries through our efforts other than through the purchase of goods in free markets and the investment of our capital under mutually advantageous conditions.

The Commission also "is convinced that if the United States and other free nations are to have such strength they must coordinate their resources to the ends of common growth, common safety, and common welfare." It is difficult to see how such broad objectives can be covered in a few words in a report dealing with materials. If our resources are to be coordinated, as the Commission suggests, it is presumably through some form of world government and the President's Materials Policy Commission was not charged with the task of developing world government.

From the postulates already given, the Commission arrives at the formulation of its major premise upon which all the rest of its report is based: "The

overall objective of a national materials policy for the United States should be to insure an adequate and dependable flow of materials at the lowest cost consistent with national security and with the welfare of friendly nations."

The Commission does not define what it means by "lowest costs," nor does it define "consistent with national security." Our security may demand a going concern mining industry in this country. If the Commission means that we should secure the materials we need at the lowest costs under a free-enterprise economy, that is one thing—but, if it means hidden subsidies to domestic or foreign producers which will tend to mask the true costs by transferring a part of the costs to the general taxpayer, that is something else again.

In the past, free markets have provided the United States with all the materials required. There is no evidence that free markets will not continue to provide for our needs. The Commission implies that the United States, in setting a national materials policy, is responsible for the welfare of friendly nations. There is no evidence that the people of this country are willing to assume this responsibility. Free markets which deal impersonally with the distribution of materials will insure better international relations over the long run.

CHAPTER II. DIMENSIONS: PAST AND FUTURE

This chapter reviews the growth in our consumption of materials over the past 50 years, and forecasts what will be required in 1975.

Page 5 contains the statement, "Indeed, there is scarcely a metal or a mineral fuel of which the quantity used in the United States since the outbreak of the First World War did not exceed the total used throughout the world in all the centuries preceding." This statement has no meaning as one could take the production of aluminum during the first 10 years following the development of the Hall process and make the same statement, that is, that the consumption of aluminum during that 10-year period exceeded the total used throughout the world in all the centuries preceding.

Obviously, as technology finds new uses for materials our production will increase and since the industrial age represents such a small portion of recorded history, a statement such as the one quoted from page 5, while true, has absolutely no significance.

The Commission continues:

"The minerals increase is compounded partly out of the needs that rise with growing populations, partly out of a per capita consumption which has increased threefold in the same time, and is still growing. Fundamentally it reflects the increasing mechanization of modern society. As a result of the turret lathe and tractor, the automobile and airplane, the submarine and tank, the electric washing machine and vacuum cleaner, we have been drawing down our most exhaustible resources even faster than the resources that can, in theory at any rate, be renewed. A ton of ore removed from the earth is a ton gone forever; each barrel of oil used up means one less remaining. This mounting strain upon resources that canont be replaced has become the most challenging aspect of our present-day economy."

Pages 7 and 8 of the summary of the Commission's report, published by the Superintendent of Documents as a separate pamphlet, contains statements which did not appear in the report itself. They read:

"Neither the next 50 years nor even the next 25 can see a growth in minerals consumption at the same increasing swift rate unless profound changes in trade and technology occur; in their absence, such increases could not be stood.

"All the copper ever discovered in the United States up to now would last only 25 years at the rate of consumption projected for 1975; all the lead would similarly last only 18 years, all the zinc only 30 years. In short, handing over the United States mineral deposits, intact and pristine as they were in Columbus' day, to our children in 1975 would scarcely help them solve their materials problem at all."

These statements by the Commission and in the summary while again literally true, have little meaning as the Commission demonstrates that proven reserves of oil and other materials have increased over the past 50 years, rather than decreased. These statements are designed to set the stage for further Government intervention.

"The Road Ahead," a subhead on pages 6 and 7, outlines the premises upon which the Commission's forecasts of demand are based.

The Commission, in forecasting the 1975 material requirements, makes the following assumptions:

"* * * it seems reasonable to expect considerably steadier levels of employment and economic activity in the future, in line with the avowed national objective of making major depressions a relic of the past."

The Commission, after consultation with the Bureau of the Census, estimates the United States population at 193 million by 1975. This is based on estimates by population experts, ranging from 180 to 220 million. The difference of 40 million between the high and low estimates is 22.2 percent of the lower figure.

The Commission also assumed a working force of 82 million people. On December 10, 1952, the Bureau of the Census released a study, A Projected Growth of the Labor Force in the United States Under Conditions of High

Employment: 1950–75. It estimated a labor force of 89 million by 1975. After allowing for frictional unemployment of 3 percent, full employment would require 85 million jobs, including those in the Armed Forces. This discrepancy between the estimates of the Commission and the Bureau of the Census occurred during a 6-month period. How then can we seriously hope to forecast the population 25 years ahead?

The Commission assumes that the workweek will be reduced by 15 percent, or to about 34 hours per week.

The Commission assures that man-hour productivity will increase at a rate of 2½ percent annually during the next 25 years against a somewhat smaller past rate of 2.1 percent, because of our national objective of "making major depressions a relic of the past."

Based on the factors listed above, the Commission proceeds to project the general magnitude of demand for various materials. It is difficult to understand what these projections serve in view of the statement made on page 7, as follows:

"These projections do not predict how much of each material will actually be available and consumed. Instead, they are an estimate of what might be demanded if relative prices of various materials remained the same as in early 1950, which they are most unlikely to do. Moreover, these projections assume no unforeseeable new uses, substitutions, or technological improvements. They are intended solely as a starting point in the analyses of prospective supply-demand conditions and give only a rough measure of magnitudes."

It is important at this point to discuss the implication of the above quotation at some length. In the first place, the technology section in volume IV of the Commission's report reviews possible new uses, substitutions, and technological improvements for all materials; therefore, projections based on the assumption that this will not happen are completely inconsistent with the rest of the report. The assumed increase in man-hour productivity of 2.5 percent would only result from new technology which would change the demand for specific materials.

The report, on page 9, shows two charts. These have been converted to the following tables:

Materials demand, new materials—Projected increase in demand 1970–80 compared with 1950

	United States	Other free world		United States	Other free world
	Percent	*Percent*		*Percent*	*Percent*
Tin	18	30	Nickel	100	100
Zinc	39	61	Petroleum	109	275
Copper	43	54	Tungsten	150	150
Iron ore	54	73	Fluorspar	187	260
Rubber	89	203	Aluminum	291	415

This table shows that the United States consumption of tin may rise 18 percent, zinc 39 percent, and aluminum 291 percent. It is difficult to conceive of such divergent movements from the 1950 base without drastic changes in the relative price of these materials, yet the basis for these projections of demand is that there will be no change in relative prices.

The Commission is open to serious criticism in the fact that these projections give the impression of a degree of accuracy completely unwarranted by the basic assumptions. How can anyone say that the United States aluminum demand 25 years from now will rise by 291 percent rather than 290 percent or 300 percent, or that the other free-world demand for rubber will increase 203 percent rather than 200 percent or even 300 percent?

The Commission's projection technique is so artificial as to be meaningless.

On page 7, the Commission states:

"What happens to United States demand and supply will have a strong influence on the materials situation of other nations, since many of these materials have international markets, and developments abroad will similarly have their impact in this country. For these reasons the Commission in its estimate of the future has made allowance for other free world demand, although projections of foreign demand trend are necessarily even less definite than those made for the United States. These estimates suggest that total free world demand for materials will expand considerably in the next generation and that the United

States, although its total consumption of materials will increase greatly, will probably consume a somewhat smaller share of the total supply."

The difficulties in forecasting United States demand are considerable. It seems incredible that anyone should take the estimates of the expected increase in demand for the rest of the free world seriously, in view of the complete inadequacy of data suitable for such forecasting.

If the Commission's techniques were valid, then in 1925 we should have been able to have estimated our demand for materials in 1950. In retrospect it is obvious that this could not have been done as in 1925, the television industry having not been born; jet engines with their requirements for cobalt and columbium had not been invented. Since the two-cycle diesel had not been invented and there were no diesel locomotives on the Nation's railroads, diesel fuel was not an important product of the petroleum industry. Today, 10 percent of our lead consumption is used to produce gasoline antiknock compounds. This usage was insignificant in 1925. Chromium was a relatively unimportant metal as stainless steel and the technique of chromium plating was only applied commercially on a large scale after 1929. Synthetics, including nylon, orlon, and synthetic rubber, had not been developed. The radio was just beginning to become a common household appliance. Manufactured ice was more common than the domestic refrigerator. Wide steel sheets for automobile bodies with deep drawing qualities awaited the invention of the continuous strip mill and most automobiles had fabric tops, wood body structural parts, and aluminum panels. This very brief description of the environment in 1925 shows the impossibility of making meaningful forecasts for 1975 based on existing technology and assuming that the relative prices of materials will remain the same as in 1950. Needless to say, the potentialities of atomic energy are completely omitted in this approach.

The Commission concludes chapter II with this statement:

"There is no reason to assume that a world which has been growing economically by leaps and bounds for many generations will suddenly become static in this generation. It is this certainty of greatly increased demand for materials in the future that underscores the importance of the fundamental shift in the basic materials position of the United States during the past decade."

Yes; the world has been growing economically by leaps and bounds, and no one questions that it will continue to grow. However, there is nothing implicit in this growth which has shifted the basic materials position of the United States during the past decade. On the contrary, it has been shifting gradually since the Civil War when the Nation began to industrialize on an extensive basis.

CHAPTER III. THE OPPORTUNITIES

Page 8 of the report is a very elementary discussion of the role of materials in our economy and a presentation of the changing role of specific materials over the years.

This chapter deals with the possibility of obtaining more materials from resources, domestic and foreign. It states that we can expect improvements in the techniques of exploration and discovery and fuller use of known resources. It also proposes that we use resources of lower quality and that we renew renewables, such as timber. It suggests we change the mix of materials so as to take advantage of those materials in relatively easier supply and synthesize new materials. This elementary discussion is basically sound. The statement which follows implies that the Government should show industry how to curb waste:

"At present, many profitable opportunities to cut physical wastes are being neglected by industrial companies whose equipment and production methods are outmoded and wasteful, or who have not explored carefully enough the potential profit in waste reduction."

This statement assumes that inefficient producers are not being forced by competition to improve their practices. The whole record of our economy shows that the forces of competition eliminate those firms who neglect profitable opportunities to eliminate waste and who continue with outmoded equipment and methods.

Page 10 olso contains this statement:

"The relative shift that has occurred in the United States material mix as between copper and lead on the one hand and aluminum and plastics on the other hand is shown in the chart, Technolology Brings New Materials to the Fore."

The chart referred to, which appears on page 11 of the report, has little meaning as the increasing use of plastics, for example, is not a measure in any way of the substitution of aluminum, with plastics or of any other group of materials.

The chart is very confusing as it apparently measures use as a percent by volume. Volume is not a good measure for such a chart; furthermore, since the chart does not include iron and steel, or wood, there is no measure of substitution. The chart, as drawn, has very little significance.

Page 10 includes a section entitled "Making Materials Work Harder and Longer." This particular section is one of the most objectionable in the report. It says:

"We have often used two pounds of a material where one would do. Vast quantities of material have been wasted both physically and economically by 'overdesigning' and 'overspecification.' Similarly we have frequently designed products with little concern for giving them a long life or getting maximum service from the materials and labor embodied in them."

This statement is a gratuitous insult to the engineering profession of the United States. To be sure, designs improve and as time goes on less material is used to accomplish a given task. We have improved alloys, better processing and know a great deal more about stress analysis than we did 20 years ago. At no time did American engineers overdesign merely because they wished to be wasteful. This section continues:

"We drive heavier automobiles than is necessary for mere transportation, and we adorn them with chromium because we like them that way. We blow thousands of tons of lead into the atmosphere each year from the high octane gas burned in our cars because we like quick pickup on the road and enjoy beating the other driver at the stoplight."

Yes; we could use bicycles rather than automobiles for mere transportation on many occasions. We adorn our cars with chromium which has made chromium an important industrial material. Prior to 1925, chromium was just another of the earth's elements with limited commercial interest. Yes; we blow thousands of tons of lead into the atmosphere each year, but today's engines

using modern gasoline are able to make 2 gallons of gasoline worth as much as 3 gallons were in 1925. Our consumption of lead has vastly reduced the drain on our petroleum resources and saved the steel necessary to produce the additional petroleum producing, refining, and transportation facilities, which would have been required if we attempted to do today's transportation job with the fuels and engines of 25 years ago. Furthermore, automobile engineers are improving the design of engines so as to necessitate less lead for equivalent compression ratios, and the oil companies, through catalytic cracking and reforming processes, are increasing the octane rating of petroleum products while using less lead. The Commission's report is written as though the only reason why high-octane gasoline is used is that we are a nation of hot-rod enthusiasts. Nothing could be further from the truth as the engines of 1925 which did not "beat the other driver at the stoplight" were far more wasteful of our natural resources.

The Commission itself has answered its own comments on our so-called wasteful use of lead on page 21, when it said:

"One popular fallacy is to regard our resource base as a fixed inventory which, when used up, will leave society with no means of survival. A related fallacy is that physical waste equals economic waste: the feeling that it is wasteful to use materials in ways that make them disappear. This attitude can lead to devoting a dollar's worth of work to saving a few cents' worth of wastepaper and old string.

"These fallacies together lead to a hairshirt concept of conservation which makes it synonymous with hoarding. A sound concept of conservation, in the view of this Commission, is one which equates it with efficient management, efficient use of resources and of manpower and materials: a positive concept compatible with growth and high consumption in place of abstinence and retrenchment.

"In developing America our forebears consumed resources extravagantly, but we are certainly better off in materials supply than they were. It would be unreasonable for us, their posterity, to suggest that they should have consumed less so that we might consume more. If then through developing the opportunities inherent in the flexibility of our resource base, we can provide our posterity with a better return of goods and services for their labor than we get for ours, we need not feel compelled to restrain specific consumptions of materials to make theirs even larger—any more than our New England forebears needed to conserve bayberries for candles to light a generation that lives by kilowatts. We can, if our basic materials policy is sound, provide for posterity the prospect of increasing consumption without stinting ourselves by restricting the rates of efficient withdrawals of our resources.

"Hoarding resources in the expectation of more important uses later involves a sacrifice that may never be recouped; technological changes and new resource discoveries may alter a situation completely. It may not be wise to refrain from using zinc today if our grandchildren will not know what to do with it tomorrow."

On page 11, the report points out the possibility for better utilization of scrap. However, it ignores the market mechanism which has functioned with an amazing degree of success in channeling scrap metal back to the mills. The report says:

"For so highly industrialized a Nation, our facilities for the collection, recovery, and reclamation of once-used materials is haphazard in the extreme."

Actually the normal workings of the price mechanism accomplish a remarkable recovery of scrap.

The report suggests improved industrial practices. Specifically, it suggests "the stamping of symbols on metals to show their alloying constituents, to make later identification easy and thus prevent loss of anonymous material." This is an excellent example of the impracticable, academic, and bureaucratic thinking which pervades this entire report.

In contrast to this academic thinking is a release from the General Motors Research Laboratories of March 4, 1954, announcing the development of a fast, accurate, nondestructive instrument for sorting mixed metal parts with varying alloy content known as the thermoelectric metal comparator. Industry does not need suggestions from the bureaucrats to improve its technology. It needs freedom of opportunity and adequate incentives.

The Commission attempts to give the impression that we are becoming a have-not Nation and must turn abroad for increased supplies in the future—yet the

Commission shows that we have become independent of foreign countries for silk and rubber and "we could conceivably meet our expanding needs for liquid fuels entirely from domestic resources, in part by hastening the growth of synthetic oil production from shale and coal."

In this chapter, the Commission also shows that "the industrial nations of Western Europe and Japan have strong industrial capacity and labor skills but severe resource limitations." It would appear that the development of foreign resources should be the mainstay for giving these industrial nations adequate raw materials. It is quite possible by 1975, with a much higher gross national product, we may import more raw materials while producing even larger amounts in our own country. The Commission completely omits any discussion of the necessity of maintaining a strong domestic mining industry in being as a security measure. This should obviously apply to any metal in which there are reasonable possibilities of our producing our military requirements coupled with an adequate stockpile in the event of a war.

Another approach to the problem presented by the President's Materials Policy Commission is contained in an article published in the June 1952 issue of the Atlantic Monthly, entitled "Our Inexhaustible Resources" by Eugene Holman, president of the Standard Oil Co. of New Jersey. This article stresses freedom of opportunity rather than Government planning and shows that with freedom we will have unlimited resources available to maintain our civilization. This article is included in this section.

[An Atlantic Monthly article by Eugene Holman]

OUR INEXHAUSTIBLE RESOURCES

All of us who are in any way connected with natural resource industries—geologists, engineers, executives, investors—are even more concerned than most people about how fast we are using up our natural resources. These materials have a vitally important place in the pattern of human existence, and people frequently fear that we are going to run out of one or another of them. We worry about wasting our resources or exhausting them. But I suggest that the viewpoint expressed in those terms "wasting" and "exhausting" is a partial viewpoint. I think that under certain circumstances we can forget our fears and entertain the notion of inexhaustible resources.

Let's look at the record. It shows that from earliest times men have used minerals drawn from the earth. And we see that the availability of larger numbers of minerals, in greater quantities, has progressed by a kind of steplike process.

Archeologists have shown us that prehistoric men used axes, drills, and other implements made of flint and other hard stone. With these tools they were able to create simple societies, which in turn made possible the accumulation of knowledge about the natural world.

The stone age developed both the instruments and the knowledge which enabled men to use certain of the softer metals, especially copper and tin. Humanity then stepped up to the bronze age. Now man had more tools and more serviceable ones. He could fell trees faster and thus have more buildings for shelter and more vehicles for transport. He could dig deeper and fracture rock more readily. He could move more widely than before over the earth.

As the men equipped with bronze tools learned more and more about the world, humanity stepped up again—this time to an age of iron. Now man began fashioning a really formidable array of tools. He had new power to cut, grind, hammer, and otherwise work materials. He could handle masses of material with stronger levers, wedges, pulleys, gears, hooks, eyes, and pinchers.

In modern times the age of iron has given way to the steel age. And within our own lifetimes there has been superimposed on the steel age what we may call the age of lightweight metals, plastics, and atomic fission.

From the stone age to the present so great a wealth of scientific information has been amassed—most of it in the past 100 years—that we now have tools and instruments of a power and precision beyond all previous imagination. We have the means to compound, cast, and grind lenses and mirrors that permit us to peer farther than ever before into matter and into space. We command the strength of engines whose ratio of power to weight is constantly being increased. We have machines to produce millions of glass tubes whose miraculous contents harness a stream of electrons to our service.

A notable feature of the steplike pattern of material progress is that it has proceeded at a geometric rate. Each successive age has been shorter than the one before it. The stone age lasted several hundred thousand years; the bronze age, 4,000 years; the iron age, 2,500 years. Steel was first made in commercial quantities 95 years ago, and the past 20 years have seen material developments that are almost incredible. It is as though the stairway of advancement were composed of steps with progressively higher risers and narrower treads.

Another outstanding feature in the history of material progress is that each step has been dependent on the one before it. The use of the materials available in one period—and I emphasize that word "use"—has supported societies in which men could accumulate knowledge. Such knowledge then made new quantities and new kinds of material available.

I emphasize the fact that people used the materials available in any period so that a fallacy one sometimes finds in connection with the conservation of natural resources will be crystal clear. This fallacy is the concept of conservation as nonuse. I am convinced that nonuse results only in hobbling progress. It will not result in more natural resources for men to use but less, because it retards the march of scientific knowledge.

Now it goes without saying that I do not advocate reckless squandering of natural resources. What I do advocate is true conservation—which is not hoarding but efficient and intelligent use.

2. Increasing knowledge operates in a number of ways to expand the natural resources available to us. It helps us to discover new sources of materials which we are already using and in the raw form that is currently useful to us. For example, new techniques like the use of the airborne magnetometer help us to locate oilfields. New knowledge also enables us to extract a material we are already using from raw forms which we were previously unable to process, such as iron from taconite. It also extends supplies of the familiar materials by developing more efficient methods of use. Improved heating units, turbines, and internal-combustion engines are cases in point here. More knowledge helps us work out means of using materials which have been known but not usable—as, for example, titanium. And it discovers or makes entirely new materials that do not exist in nature, such as plastics.

I'd like to enlarge a bit on these examples and their significance. Take petroleum.

A great many new sources of oil have been discovered in just the past several years. To mention only a few, there are the Williston basin in North Dakota, the Uinta basin in Utah, and the Alberta fields in Canada, the Scurry and Spraberry fields in Texas, in addition to fields in central Sumatra, southern Iraq, and the Cretaceous fields of western Venezuela. In some of these areas, geologic explorations had gone on for years without any oil ever having been found before. In others, oil had been produced before, production had subsequently fallen off, then new horizons were tapped.

By producing and using oil we have built a dynamic oil industry and have developed the means, both financial and technical, to find more oil. We have invented methods for locating and mapping structures with greater speed and accuracy. We can select where to drill a structure with better odds of success. We can reach deeper strata. As a result, in the United States alone, there has been produced since 1938 as much oil as was known to exist in the country at that time. And despite that great withdrawal, the domestic industry's proved reserves are at an alltime high level. It's as though we started out with a tank of oil, used it all up, and had a bigger tankful left. The wisdom of optimistic men in our profession, like Wallace Pratt, is becoming daily more evident.

Besides learning more about finding underground reservoirs of crude, oilmen are also learning how to get more of the oil out of the reservoir after it has been located. We are discovering how to get maximum yield from large, highly porous reservoirs of the Middle East type, where the water table is important, as we are also learning how to get maximum yield from tricky, tight reservoirs. Repressuring, waterflooding, and other techniques of secondary recovery are also adding greatly to the quantities of oil available for people's use. The supply of usable oil is increased also by improved practices in its transport and handling, which cut down losses.

New developments in the science of refining make possible better products. This fact, coupled with improvements in consuming devices, means that we can

get more work from a barrel of oil today than we could previously. And I think we've only begun to use the energy potential in a barrel of oil.

Not only are we finding new sources of liquid hydrocarbons in the familiar raw form of crude petroleum; we will be able, when and if it ever becomes necessary, to derive liquid hydrocarbons from oil shales, tar sands, coal, and other sources not used at present.

Finally, our present use of oil and coal supports an industrial and scientific structure in which men are already learning how to apply atomic power to constructive work and may learn how to harness solar energy. Such developments, of course, would probably displace the fossil fuels in some applications, thus making them available for other use. The overall effect would be to increase still more the total amount of energy available to humanity.

Incidentally, in connection with atomic energy, two news items which I recently noticed have a bearing on our subject.

Only a few months ago it appeared that the future use of atomic energy for industrial purposes might be doubtful because of the problem of the radioactive wastes. Yet only a few weeks ago, a Government official reported that the solution is in sight. What he called atomic garbage is apparently on the verge of being employed in such a way as to be not just harmless but actually useful.

The second story was about a new atomic plant, called a breeder reactor, now in operation. As I understand it, the object of the process is to use uranium 235, which is rare and costly, to convert nonfissionable materials, which are abundant and cheap, into fissionable material at a faster rate than the uranium 235 itself is consumed. One of these nonfissionable materials is thorium, which previously was used chiefly in the manufacture of mantles for gaslights.

3. I have been considering mineral energy resources. Now let us look at the picture for metals. There are 45 metallic elements and some 8,000 alloys of those metals now in commercial use.

The world in general, and the United States in particular, is using metals at a rate never seen before. Two world wars in a quarter century and the present unhappy need to build great quantities of arms have used vast amounts of iron and copper—to name but two metals in demand. Our steel-expansion program now underway calls for annual production of 120 million tons—15 million tons more than we turned out last year. And, to meet our new needs, we plan to step up our domestic production of copper (which last year was about 1.2 million tons) by 225,000 tons, and aluminum by 700,000 tons.

Can we say that what has proved true of fuels will prove true of metals? We have seen that increased knowledge has led to the discovery of new sources of energy which are seemingly unlimited. Does a comparable outcome seem likely with respect to metals?

The metals we use most—iron and aluminum—are second only to the elements of oxygen and silicon in their abundance on our planet. It has been estimated that there is at least 5,000 times as much iron ore, bauxite, and alunite in the earth's crust as the world now uses annually. Furthermore, unlike fossil fuels, most metals can be reclaimed after use and used again. In the meantime, the discovery of new sources of metal supplies and the development of techniques for making them economically available go on at a rapid pace.

It wasn't so long ago that people were worrying about imminent depletion of the 50-percent iron-ore deposits of the Mesabi Range. Today a number of steel companies are planning or building facilities, estimated to cost over three-quarters of a billion dollars, for processing taconite. Taconite deposits in Minnesota occur in a hundred-mile strip, several miles broad, and are believed to amount to 5 billion tons. The reducing plants will turn out about 1 ton of 60-percent iron from every 4 tons of taconite.

Rich deposits of iron ore have been found in a number of countries outside the United States and are now being developed, in many cases by American capital. Labrador, Venezuela, and Brazil, for example, are the scenes of some truly epic engineering projects. A 358-mile railroad is being cut through wilderness and wasteland to haul ore from the Ungava area in Labrador to water. At Steep Rock Lake, Ontario, 70 million tons of a lake bed are being removed in a 4-year dredging operation to get at an iron deposit underneath. In El Pao, Venezuela, 1 of 2 projects in that country has been completed after 14 years of work. Ore has to be shipped by a railroad built through jungles, and by barge to the sea on a river whose water level at the loading point fluctuates 43 feet at different seasons.

We take aluminum for granted these days. It costs currently about 18 cents a pound. Yet when the Civil War started, it sold for $545 a pound. United States production now amounts to about 800,000 tons per year, and plants under

construction will almost double that figure. If it becomes necessary to find substitutes for bauxite or alunite ores, chemists seem confident they will be able to produce aluminum oxide from aluminum-bearing clays.

The first plant to extract magnesium from sea water went into operation only 11 years ago with a capacity of 9,000 tons a year. Magnesium production in the United States for 1952 is expected to exceed 100,000 tons. As for the future—there's a lot of water in the sea.

Titanium is one of our most abundant metals and has long been known. What we have not known is how to extract it from the earth's crust at a cost which would make it economic for large-scale use. Up to 5 years ago, titanium was used chiefly as an ingredient in paint. But it is lighter than steel, stronger than alumium, and highly heat resistant—hence potentially very useful. Present extraction processes are still expensive, but I have heard that a more economical method is being developed.

With almost every metal the story is repeated—of widening use, of the discovery of new sources and better methods of extraction. Here, as in other fields, research and ingenuity have been great multipliers of our natural resources.

Our supply of metals is being supplemented by other rigid materials—both old ones put to new uses and newly discovered ones. Glass, for example, is an ancient product that has been improved in recent years to the point where it can take the place of many other substances. And it is made of materials whose supply is practically unlimited.

As for plastics—mere infants in comparison with Granddaddy Glass—there seems no limit to the possibilities of synthesizing organic compounds. A hint of some of the things to come may have been contained in a story I read only a month ago of an automobile body made of plastic and layers of glass fiber. It was claimed the body is dentproof, rustproof, and, for its weight, stronger than steel. When you consider the large fraction of our steel output that goes into auto bodies you can perhaps imagine what a successful plastic body would mean in terms of metal supply. That's especially impressive when you consider further that plastics can be made from corncobs, oat hulls, the spent fibers of sugarcane, and other materials we used to regard as waste.

These benefits are available to us as they become economically feasible, in that orderly natural development characteristic of all true technical progress. We discovered long ago that the real usefulness of any new product or process begins only when its economy in use surpasses the economy of that which it is supposed to replace. We could, for example, grow bananas at the North Pole, but the usefulness of such a project is clouded by considerable doubt.

For many years, I believe, people have tended to think of natural resources as so many stacks of raw material piled up in a storehouse. A person with this sort of picture in his mind logically assumes that the more you use of any natural resource, the sooner you get to the bottom of the pile. Now I think we are beginning to discover that the idea of a storehouse—or, at least, a single-room storehouse—does not correspond with reality. Instead, the fact seems to be that the first storehouse in which man found himself was only one of a series. As he used up what was piled in that first room, he found he could fashion a key to open a door into a much larger room. And as he used the contents of this larger room, he discovered there was another room beyond, larger still. The room in which we stand at the middle of the 20th century is so vast that its walls are beyond sight. Yet it is probably still quite near the beginning of the whole series of storehouses. It is not inconceivable that the entire globe—earth, ocean, and air—represents raw material for mankind to utilize with more and more ingenuity and skill.

This conception of limitless raw material is not new. It is held by a number of persons. But it is an idea certainly not familiar to people at large. I notice, though, that Dr. Lahee's recent American Petroleum Institute report is receiving wide publication. It's the one that shows that for every barrel of crude oil or cubic foot of natural gas withdrawn from the ground in 1951, 2 new barrels of oil or cubic feet of gas were found or developed. Perhaps the idea is getting around.

I should like to point out a corollary to this thesis. It is that the concept of unlimited raw materials does not mean that progress is simple and that Utopia is at hand. On the contrary, raw materials, no matter how vast in amount, do not become available resources until human thought and effort are applied to them. In a very real sense raw materials do not exist, they are created. We know, for example, that in a region of great mineral wealth, people can grind out their lives in poverty and misery if they do not realize

the wealth exists or if they do not know how to get at it. It is use that makes it valuable. Even when the wealth is made available through technical means, the accelerating growth of populations and the enormous wastage of war are additional complications to consider.

So the march up the steps of material progress, or from storehouse to storehouse—according to which figure of speech you prefer—depends not alone on the continued expansion of scientific knowledge and on industrial daring and managerial skill, but also on political and social conditions. Those conditions in many parts of the world today are not conducive to progress. In fact, extreme nationalism, government controls, and monopolies, currency restrictions, abnormal tariffs, threats of expropriation, wars and revolutions, have sealed the doors to many storehouses of useful raw materials.

The basic requirement for progress is freedom—freedom to inquire, to think, to communicate, to venture. Without these conditions, the human mind and spirit will be so shackled that the availability of natural resources will be limited and we may exhaust the known sources of some needed material and find nothing to replace it. To the free man, all things are possible. Opportunity is the wand which can change the useless into the useful, waste into raw materials of great value, exhaustible resources into inexhaustible resources. It is the key that unlocks the greatest energy source of all—the infinite power of the human individual.

The longer I live, the more convinced I am that material progress is not only valueless without spiritual progress; it is, in the long term, impossible.

CHAPTER IV. THE DIFFICULTIES

This chapter stresses that the Nation faces a potential problem of rising real costs for its raw materials.

Real cost is defined as the price of a material in relation to the general level of prices.

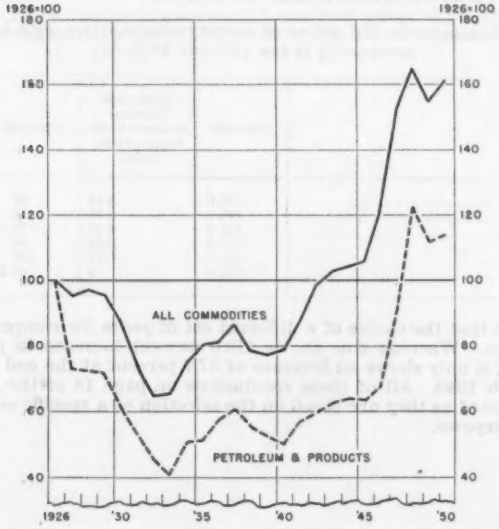
The report endeavors to give the impression that we are already facing a trend of rising material costs based on changes in the decade, 1940–50. The President's Materials Policy Commission infers shortages of certain materials as their data shows the prices of these materials rose faster than the all-commodity index. This is unrealistic since the selection of these years as a base for comparision purposes is unfortunate. Preparations for war influenced the commodity markets in both years and mark normal long-term movements. A comparison of the price movements for the commodities selected on page 14. over the period 1926–50, is shown in the table below:

Comparison of changes in the prices of specific commodities with changes in all-commodity index (decade 1940–50)

	1940=100	Difference between changes in all-commodities index	1926=100	Difference between changes in all-commodities index
Zinc	119.0	+14	89	+27.5
Petroleum	149.0	+44	14	−47.5
Farm products	152.0	+47	70	+8.5
Lead	157.0	+52	58	−3.5
Lumber	218.0	+113	227	+165.5
All commodities	105.0	0	61.5	0

It is obvious that the choice of a different set of years for comparison changes the conclusions. Whereas zinc shows 119.0 percent increase in price between 1940 and 1950, it only shows an increase of 57.7 percent at the end of 1953 when compared with 1940. All of these conclusions on page 14 of the PMPC report may be discounted as they are based on the selection of a specific set of dates for comparison purposes.

THE RELATIVE PRICE CHANGES BETWEEN PETROLEUM AND THE ALL COMMODITY INDEX DEPENDS ON THE YEARS CHOSEN FOR A BASE



The chart shows what happens to the comparison of prices between petroleum and the all commodity index when 1926, the base for the old wholesale price index, is taken rather than 1940 as used by the Paley Commission. If the base is 1940, then petroleum has risen faster than the all commodity index as stated by the Commission. On the other hand, the chart shows that when the base is 1926, the rise in petroleum is far less than in the all commodity index.

The Commission itself shows that price movements in themselves do not indicate a depletion of resources, but on the contrary may indicate that conservation is being practiced. In the table on page 14, the price of lumber increased 218 percent between 1940 and 1950. This should be considered in the context of the Commission's statement on page 37:

"Until quite recently the whole price structure reflected, and consequently reinforced, the attitude that the Nation's timber could be treated more as a mine product than a crop. Price of products was determined mainly by costs of logging, milling, and transportation. Standing timber was procurable at prices that did not allow for the costs of regenerating the timber crop. Since 1940, however, the relative rise of timber prices has stimulated sustained-yield production, and prices now seem to reflect the costs of protecting standing timber and of regeneration."

The Guaranty Survey for August 1952, published by the Guaranty Trust Co. of New York, said:

"The long term significance of recent shortages and rising costs is open to question. The United States has been and still is experiencing an extraordinary boom. At such times, and especially after great wars, numerous materials are found to be relatively scarce, and their costs tend to rise. At a time of generally advancing prices, moreover, costs of raw materials commonly rise faster than prices of manufactured and processed goods. When the reaction comes, their fall is correspondingly more rapid. If the United States has been 'consuming' more raw materials than it produces, part of this consumption has been for the purpose of meeting exceptional foreign demand for the goods made from those and other materials."

[From the Guaranty Survey, published monthly by Guaranty Trust Co. of New York, August 1952, vol. XXXII, No. 4]

The Materials Outlook and Free Enterprise

The report of the President's Materials Policy Commission on Resources for Freedom is thought-provoking, not only because of its estimates of the future raw-materials needs of our expanding economy but even more because of the fundamental question it raises concerning politico-economic philosophy and outlook as applied to those needs. That question is whether the free processes of dynamic capitalism wil continue to provide raw materials or whether the production, distribution, and prices of such materials are to be subjected to increasing political control.

The Commission was appointed by the President about a year and a half ago. The gist of its five-volume report is that the United States, along with the rest of the free world, faces grave future problems of raw-material supplies and that private enterprise cannot safely be relied upon to do the job.

Under any administration with a predilection for intervention in economic affairs, such a view of the outlook and the Nation's needs could become the occasion or pretext for lasting political domination of the supply of basic raw materials. Before any such hazardous program is seriously contemplated, now or at some future time, a few underlying considerations deserve thoughtful examination.

Is the United States really becoming a "have not" nation? Has private enterprise ever failed to meet foreseeable needs for raw materials? Is there good reason to suppose that government can provide for such needs more abundantly or more cheaply than can private enterprise? Under a regime of international political control of raw materials, what would be the outlook for the freedoms to which we and other non-Communist nations profess to be devoted? What would be the outlook for lasting amity among these nations?

THE PRESENT SITUATION

The Commission deems that the United States has already crossed the borderline between surplus and deficit in raw materials. In support of this view, it cites the shortages and rising costs that have been experienced in recent years. It points out that, of about 100 leading minerals surveyed, approximately a

third originate domestically, a third are derived entirely from foreign sources, and a third are partly foreign and partly domestic. In 1900, it finds, the country produced 15 percent more than it consumed of raw materials other than foods and gold. By 1950 this surplus had given way to a 9 percent deficit.

The long-term significance of recent shortages and rising costs is open to question. The United States has been and still is experiencing an extraordinary boom. At such times, and especially after great wars, numerous materials are found to be relatively scarce, and their costs tend to rise. At a time of generally advancing prices, moreover, costs of raw materials commonly rise faster than prices of manufactured and processed goods. When the reaction comes, their fall is correspondingly more rapid. If the United States has been consuming more raw materials than it produces, part of this consumption has been for the purpose of meeting exceptional foreign demand for the goods made from those and other materials.

From the long-term standpoint, as a country becomes more industrialized and exports more of its manufactures to foreign countries, it naturally tends to become a larger importer of raw materials. Such a nation is not necessarily a deficit nation in a significant sense.

Despite these reservations, there is no reason to dispute the Commission's broad conclusion that the United States is moving toward a situation of less abundant home supply of some major raw materials. Increasing imports of crude oil and steps to supplement the domestic supply of iron ore from Canadian and South American sources come readily to mind in this connection.

THE OUTLOOK

By 1975, the Commission believes, the 9 percent raw-material deficit of 1950 may become a 20 percent deficit, and the United States may be importing raw materials at the rate of $3 billion a year. This estimate is apparently arrived at by means of a series of projections of demand based on an assumed population of 193 million, a working force of 82 million, and a gross national product of $566 billion, about double the 1950 figure. To support such a product, an increase of from 50 to 60 percent in the total supply of industrial raw materials is believed necessary. This covers such unequal increases as 10 percent in timber, 40 percent in agricultural products, 40 to 50 percent in iron, copper, lead, and zinc, 60 percent in coal, 100 percent or more in liquid fuels, 200 percent in natural gas and fluorspar, 300 percent in bauxite for aluminum, and perhaps from 1,700 to 1,900 percent in magnesium.

Although the assumptions underlying these forecasts are reasonable, the Commission recognizes that, in attempting to project economic trends a quarter of a century into the future, it is on shaky ground. It disclaims any intention to make firm predictions of future needs and describes its figures as indicators of the size of the problems the United States is likely to face.

It seems a fair question whether the figures can be accepted even as indicators. To raise this question is not to disparage the efforts of the Commission, which has made perhaps as intelligent a set of guesses as can be made at present. A quarter of a century, however, can bring sweeping and unpredictable changes in relative costs, new discoveries and inventions, and shifting channels of consumer demand, to say nothing of wars and depressions. The Commission itself touches on some of these possible changes when it refers to wasteful methods of extraction and utilization of resources and to the fact that only 11 percent of the country's surface area is adequately mapped geologically and that perhaps half of the subsurface area "is covered with a mantle of 'young' rocks, which may conceal vast riches." In the face of such uncertainties, even the most careful quarter-century projections of past trends would seem unreliable.

REMOVAL OF TRADE RESTRICTIONS

The Commission is probably on firm ground in anticipating a substantial increase in the total demand for raw materials and in concluding that the trend toward greater imports seems inescapable. This is no cause for concern. On the contrary, it is the strongest possible foundation for a healthy development of world trade. Greater imports mean greater exports. To those who have been struggling with the problem of the dollar gap, the prospect of a growing American market for foreign raw materials will be most welcome. All this is recognized by the Commission, which says in its report that the interchange of commodities between industrial nations and resource-rich but relatively underdeveloped countries can take place to the tremendous advantage of each.

Such prospects are, of course, impossible to reconcile with any lingering desire for economic isolation and self-sufficiency that may exist in some sections of American opinion. The Commission accepts the full implications of its position with respect to foreign-trade policy. It advocates the continuation and expansion of the reciprocal-trade program, the unilateral elimination of import duties on needed materials, and the repeal of the buy-American and similar statutes. Such restrictive laws discount the need for imported materials, are inconsistent with the quick and economical acquisition of national stockpiles, and weaken national security by causing more rapid depletion of domestic natural resources than market conditions warrant.

OBSTACLES TO PRIVATE ENTERPRISE

The Commission has performed a valuable service also in stressing the need for intelligent conservation, for stimulating the discovery of new natural deposits, and for technological improvements leading to more efficient utilization. The real threat, it says, is not the threat of absolute shortages. We need not expect that we will some day wake up to discover we have run out of materials and that economic activity has come to an end. The threat of the materials problem lies in insidiously rising costs which can undermine our rising standard of living, impair the dynamic quality of American capitalism, and weaken the economic foundations of national security. The central challenge of the materials problem is therefore to meet our expanding demands with expanding supplies while averting a rise in real costs per unit.

It is undeniable that, if a rise in costs is to be averted, the solution lies in conservation, new discovery, and improved technology. The Commission, however, is not satisfied with these answers. The real question, it says, is whether capital, equipment, technology, and management skills will flow into the expansion of lowest-cost sources of supply in the less-developed countries at a rate sufficient to yield the necessary production. * * * The entire situation provides no basis or a complacent assumption that free-world countries will automatically produce enough to meet their increasing materials needs.

A partial answer to the Commission's doubts on this score is to be found in the record of private enterprise. In the case of petroleum, for example, the farsighted acquisition of foreign reserves by private corporations has done far more than furnish supplementary sources of oil for civilian needs in the United States. It has also done much to buttress the military strength of the free world in its efforts to provide safeguards against further Communist aggression. Similar foresighted action has been taken in steel, copper, and other basic industries.

If the investment of private capital in the development of new foreign resources has not proceeded faster, the reason lies largely in the obstacles placed in the way of such investment by political action. This is recognized by the Commission, which reviews such factors as fears of expropriation, restrictions on currency conversion, export controls, nationalistic personnel and capital requirements, and unpredictable future political policies. To overcome such obstacles, the Commission recommends the negotiation of investment treaties between the United States and countries with undeveloped resources.

FREE ENTERPRISE NEEDS FREE MARKETS

Insofar as governmental action tends to remove previously imposed restraints, it can be helpful. The Commission, unfortunately, does not confine its recommendations to action of this kind. It proposes a set of devices to meet what it calls the problem of materials market instability; that is, in plain language, to manipulate prices, production, and exports by international agreement. Multilateral contracts on the model of the International Wheat Agreement would establish floor and ceiling prices. Buffer stocks would be bought and sold by a special international authority to offset natural fluctuations in supply and demand. Quotas, or restrictions on production and exports, would be used in conjunction with the buffer stocks to prevent long-continued downward trends in prices.

The whole history of domestic and international trade bears witness to the difficulties and perils that arise from well-meaning but misguided attempts at market manipulation. Almost every basic commodity entering into world trade has been the object of such attempts at one time or another. The record, it would seem, ought to be enough to discourage further experiments along the same line.

Price fluctuations can be troublesome. To some individuals and groups, they can be disastrous. Nevertheless, they have a function to perform, and that function cannot be effectively performed in any other way. The inconveniences that arise from price changes are insignificant by comparison with the evils that can result from price controls—the deep-seated economic maladjustments, the organized injustices, the international resentments and jealousies, the constant pressure to prevent the unwanted effects of existing controls by imposing new ones.

The President's Commission fears that the uncertainty of earnings due to price changes is a deterent to the development of new resources. It has not been so in the past—not until governments or private groups have undertaken to insist upon market stability, or market rigidity—as the price of cooperation.

If free competitive enterprise is made truly free and truly competitive, there need be no fear that it will fail to make available all the materials needed on an economical basis. It is generally the doctrinaire "social planner" who, ignoring the lessons of experience, argues that government can do it better.

The Commission should be commended for its statement:

"A materials policy, broadly conceived, must provide a framework for public programs, and for private policies and actions, all moving harmoniously toward the same national objectives. It is the Commission's belief that the bulk of the task of insuring adequate future materials supply can best be carried out by private business under the competitive market structure, operating within broad policy outlines which it is the responsibility of government to provide."

It should also be commended for its description of the price system, given on pages 17 and 18:

"In the United States, the free price system has always been the great 'allocator' of resources and materials. It provides a combination of incentives and discouragements to which private business and consumers variously respond in making investments, raising or lowering production, directing technological efforts, substituting materials, and so on. This system in effect spreads decision making over millions of people and provides a strong incentive to efficiency. On the whole, it produces good results when judged by its service to the public interests—but not always perfect results."

The Commission, through a series of charts, has shown how real cost increases have been averted in the case of copper. This is a good explanation and a good statement.

The Commission, on page 18, says:

"The guide to public action must therefore be a study of where the private market works so imperfectly that something must be done about it."

A review of our history shows that governments, themselves, have been responsible for many of the imperfections of the private market. The violent gyrations in prices usually accompanied wars and the subsequent deflation. There is no evidence that left to itself, the private market works imperfectly.

This chapter also deals with the role of the Government. The subtitle on page 19 (the role of government "as guardian of foreign relations and national security") mentions the participation of the United States in emergency international materials allocation programs (IMC), which at the time this report was written had never been sanctioned by the Congress. Such programs do not increase our resource base; on the contrary, they restrict our freedom to expand and guard the security of the free world.

The Commission discusses the role of government as buyer and user of materials and states "It thus exerts strong influence on market conditions, as in stockpile buying." Certainly the thinking behind the stockpile program was to minimize such influences and the Congress did not contemplate using the stockpile to stabilize market prices.

Page 20 of this chapter is devoted to a discussion of the least-cost principle which the Commission has adopted as its criteria in appraising all its recommendations. Certainly no one can quarrel with the basic concept that materials should be obtained at the least cost possible for equivalent values.

Acceptance of this concept, however, does not imply endorsement of the Commission's recommendations that protection for the American producer may be dispensed with. The Commission states that the idea of protection "is an idea based on unemployment psychology." The Commission assumes, as it has already stated, that unemployment and depressions will never recur. It further states:

"In a full employment situation the supply of any material from abroad at a price below that of our domestic costs (provided it does not represent a temporary dumping), does not lower the standard of living but actually helps push it higher.

"It is true that where our domestic industries face a considerable reduction in output, with employees and capital unable to transfer quickly to more remunerative activities, the Government has the responsibility of easing the transition to the new situation. This, however, is hardly likely to be an important problem in the materials field, where even the declining industries are likely to be faced with a shortage of manpower rather than a labor surplus problem."

The implication of this quotation is that the United States is committed to a full employment program even if that should involve permanent deficit spending. There are many people who do not believe that we are committed to full employment at that price. The Commission recommends the repeal of tariffs but is quite willing to accept subsidies in lieu of tariffs. There is no evidence that a subsidy would be preferable to our present tariffs.

The Commission, in effect, is recommending that the Government assume the responsibilities of relocating individuals where industries decline without any estimate of the cost of the burdens which the Commission assumes should be borne by the taxpayer. It then disposes of the whole matter by saying that the problem is unimportant as even the declining industries will be faced by manpower shortage rather than labor surpluses. There have been too many distressed areas in a period of general prosperity for one to accept such an assumption.

American industry favors the reduction of tariff barriers and believes that a freer movement of trade throughout the world would raise living standards. However, it cannot go along with a program of Government subsidies for displaced Americans. While free trade in a world economy of free private enterprise is acceptable, so-called free trade in a mixed economy is something else again. As long as much of our imports come from enterprise under Government domination or subsidy, the American private producers will be wary of free trade. There are very few American producers who are not ready to take their chances in world markets if all production is by private firms and trade really flowed on the basis of comparative cost. It is unfortunate that the Commission did not suggest that we encourage private enterprise in those countries which are receiving assistance from the United States. If this were done, it would facilitate the reduction of tariff barriers urged by the Commission.

STRENGTHENING DOMESTIC RESOURCES

CHAPTER VI. THE CHANGING PATTERN OF GROWTH

This chapter is a very elementary and obvious discussion of the shifts between materials over the years. It has an unfortunate smart-alec approach with statements such as the following:

"A war occurs, and the material for tires and teething rings no longer comes from Hevea brasiliensis in Malaya but from Texas petroleum, natural gas, or ethyl alcohol made from molasses."

The chapter includes a chart on page 24 which as already indicated is completely unrealistic as it assumes no relative change in the prices of the materials under discussion. It is inconceivable that demand changes of the magnitude shown between the nonferrous metals could take place without influencing their prices. If relative price changes are accepted, then the percentage figures become utter nonsense. The Commission might as well say it is safe to assume the demand for all materials will rise, but that it is impossible since we know nothing of the technology in 1975 to infer anything about the movements of individual materials.

The comments on this chapter may be concluded by pointing out that the Commission believes titanium and cadmium may show increases in consumption of 324 percent by 1975, while magnesium may show an increase 6 times as great. This is completely unrealistic.

Magnesium production today is substantial. Titanium production is very small. We are just beginning to learn how to use titanium. If progress with titanium continues, as seems likely, the price relationship between titanium and other metals will undoubtedly change, and since the present consumption base for titanium is so small it might well be the one metal on the list under a realistic assumption of advancing technology and accepting relative changes in price, to show the largest increase in consumption by 1975.

The Commission's assumption of no relative changes in price, and no advances in technology make these consumption forecasts meaningless.

The Commission itself shows how unrealistic these figures are in the article on titanium in volume IV, chapter 6, page 65:

"Since the modern history of titanium started in 1946, production rates can be considered to be phenomenal if they are considered in relation to each other and not to the leveled-off production rates of the older metals. Consider that before 1946 annual titanium production was measured in tens of pounds. In 1946–47, it was measured in hundreds of pounds; 1947–49, in tons; 1949–50, in tens of tons; and 1950–51, in hundreds of tons. Every year or so from 1946, production jumped 10 times. Estimated production from midsummer 1951 through 1952 is about at this amazing rate. Considering the infancy of the titanium industry, production is accelerating at a very satisfactory rate. This rate of expansion can be expected to continue for a few years, and then slow down. It cannot continue indefinitely. Geometric progressions get out of hand after about 10 sequences."

The Commission also said in volume II, chapter 15, page 76:

"Inasmuch as technological developments are so uncertain, 1975 demand cannot be projected even within very wide limits. At or near present prices the demand for military and special civilian uses might possibly increase tenfold to fifteenfold by 1975. On the other hand, if a continuous economic production process is discovered and if, as a result, the price of titanium sheet adjusted for weight and performance declines to a level competitive, say, with stainless steel, the demand for titanium might reach somewhere between 500,000 to 2 million tons annually. For example, if the price of titanium were to approach 75 cents a pound in 1950 dollars, as compared with stainless steel sheet at about 40 cents a pound, it would be competitive with the latter metal and might well approach the size of the latter industry by 1975."

CHAPTER VII. DEVELOPING MINERALS RESERVES

On page 25, the Commission states, "For copper, lead, zinc, and oil, domestic takings of the past 50 years were considerably larger than present known reserves." The statement is meaningless inasmuch as the Commission itself recognizes that known reserves are merely the working inventory and do not represent the total available reserves. The known reserves of almost every mineral are many, many times greater today than they were 50 years ago.

The Commission's statement in volume II, page 5, refutes this line of thinking completely:

"Where currently known reserves are not ample, the first consideration is the likelihood of future discoveries, in order to make up for the material mined out. Such discoveries may be very important more often than not, since known reserves constitute merely a working inventory which must steadily be replenished by development and new discoveries."

On page 26, the Commission makes three recommendations which have some merit.

1. The Department of Interior, through the Bureau of Mines and the Geological Survey, should strengthen its program analysis staff and intensify its fact-gathering and analytical activities. Special consideration should be given to the economics of small mining operations.

(Comment: The Commission furnishes no criteria as to when a mine is considered small, nor does it discuss the nature of these special problems.)

2. A complementary program of fact-gathering and analysis should be undertaken by industry groups in the minerals field.

3. A complete census of mineral industries, already authorized by law, should be taken in 1954 and every 5 years thereafter.

Sufficient funds should be appropriated.

On page 27, the Commission discusses the role of Government in exploration. It should be commended for the following statement:

"Over the years, private industry in the United States has taken the lead in finding minerals deposits. This approach has worked well in the past and the Commission believes it will be best in the future."

The Commission "sees an impelling need to accelarte the topographic and geologic mapping of the United States and Alaska." Every informed person will support this statement.

On page 28, the Commission reviews the possibilities of improvements in the techniques for subsurface exploration. This is a good statement as the discovery of Cerro Bolivar iron deposit in Venezuela is evidence of what can be accomplished.

On page 29, the Commission makes three recommendations with repect to better prospecting techniques:

1. "That Congress direct the United States Geological Survey to accelerate the topographic and geologic mapping of the United States and Alaska, and that appropriations for this purpose be increased sufficiently to permit an expansion of the program by 50 percent within 5 years and 100 percent as soon thereafter as sufficient trained personnel is available.

2. "That the United States Geological Survey and the Bureau of Mines work out and submit to Congress a detailed program under which a coordinated national system of libraries of core samples, log data, and other geologic evidence can be established and maintained in cooperation with State mining agencies and the mining industry."

3. "That an intensive program of basic scientific research and technical development be undertaken on techniques and instruments of exploration for minerals."

These recommendations are all good and should be supported.

The Commission should be commended for its statement that "The traditional division of responsibility between private industry and Government still appears

best, although private search for many metals needs to be stimulated." The Commission recommends:

"That direct exploration activities by Government be limited to those situations in which the national interest requires enlargement of reserves or knowledge about reserves but in which the risks are so great or the promise of reward in a reasonable period so small that private industry cannot be expected to undertake the work."

There may be some argument as to whether United States taxpayers should be taxed to pay for exploration on private lands.

Pages 30, 31, and 32 discuss the merits of the present mining laws versus mineral leasing. The Commission's recommendations would give the Federal Government increased control over the mineral lands of the West. There is no evidence that the present laws are unsatisfactory. In fact, these proposals have been advanced by the Interior Department for many years. Without further evidence, the mining laws should not be revised as recommended by the Commission.

Page 33 deals with the question of Government financial incentives for mineral production. This section introduces the concept that it is the responsibility of the Government to stabilize the prices of minerals, and that if this can be done in the future there will be less need for supplementing the price mechanism by special arrangements.

If prices were stabilized, as the Commission suggests in a later section of its report, there would be no price mechanism and in time the economic decisions would all be made on the basis of the stabilization schemes.

The Commission suggests that tariff barriers be eliminated, and that domestic producers be protected by long-term purchase contracts, Government loans and guaranties, tax concessions or premium payments in lieu of a tariff.

All of these suggestions introduce more Government planning and Government direction of the mineral industries, and if carried out would lead to undetermined burdens on the Federal Treasury and an extensive bureaucracy for their administration.

The Commission states that "Long-term contracts and standing purchase offers for domestic production are well suited for use with certain minerals which are either chronically scarce or expected to be so during the period of the contract or offer." This statement should be considered in the light of what has recently happened to lead and zinc where the prices have fallen drastically within the past 6 months.

The Commission's recommendation requires a definition of the conditions under which the material is either chronically scarce or expected to be so. It would appear that it would be very difficult to evolve a satisfactory definition to implement this recommendation.

The text shows that Government loans for development and extension of facilities have seldom been the decisive factor in undertaking a particular project. This statement should serve to discourage additional programs based on cheap Government loan funds.

The Commission states that during World War II the premium payments for copper, lead, and zinc combined totaled $350 million, and those for petroleum $120 million. The Commission's position on such payments is well stated:

"Applied over long periods, however, it entails increasing administrative expenses, particularly in revising cost analyses and adjusting quotas. Moreover, since premium-price plans primarily stimulate production from known reserves, their use might tend in the long run to divert energies from discovering and developing new sources of supply. In addition, they may set up a heavy drain on small reserves of scarce materials."

Pages 34 and 35 discuss tax incentives. This discussion is excellent and the Commission should be commended for its frank recommendation "that percentage depletion be retained because of its strong inducement to risk capital to enter the mineral industries." It is difficult, however, to reconcile this statement with the suggestion that the rates now provided be raised no further. It would seem that the Congress should review the rates provided for various materials in the present code, in the light of the principles outlined by the Commission and make adjustments either up or down as may be warranted.

The Commission has taken a forthright position in its recommendation "that the present limitations applicable to minerals other than oil and gas on the amount of permitted expensing of exploration costs be removed." This recommendation is good and should be supported.

The Commission suggests, on page 36, that State and local governments substitute severance taxes for ad valorem taxes on mineral reserves. This position is well taken.

This chapter concludes with a recommendation of special financial assistance for small mining operations. The Commission recommends that a Federal agency "should be empowered to make advances, up to $100,000 to any single applicant, to support prospecting for new deposits of minerals for which domestic reserves are inadequate, or for the exploration and development of known deposits of such minerals." This recommendation again opens the Treasury to an unlimited drain for mining ventures of a highly speculative nature and of very doubtful real value to the economy as a whole.

Under a free market the prices of metals and minerals will rise to a point sufficiently high to induce needed private investment. The United States taxpayers should not be asked to finance highly speculative mining ventures.

If an environment conducive to private enterprise is established, and the tax laws permit a satisfactory return after taxes, direct Government advances should not be necessary as recommended by the Commission.

The only excuse for assistance of this character would be to support a specific military or stockpiling need which could be met in no other manner.

CHAPTER VIII. MAKING THE MOST OF TIMBER RESOURCES

This chapter again indulges in forecasting for the year 1975 "assuming price relationships among timber and competing materials similar to those prevailing during the first half of 1950." This again is a completely unrealistic assumption. It is regrettable that the Commission has included such forecasting in its report.

On page 40 the Commission states:

"The forest land held in large tracts by industrial interests is comparatively well managed, and most of the present holders can be expected to raise their level of management without large-scale help from Government. The principal contribution of the Federal Government should be leadership in nationwide programs of protection against fire, insects, and diseases."

The Commission makes a number of specific recommendations that will be discussed briefly.

PROTECTION AGAINST FIRE

The Commission recommends:

"That annual Federal appropriations for the cooperative Federal-State fire-protection program be increased up to the authorized level of $20 million annually, on condition that matching State funds are contributed."

Comment: Adequate fire protection is of course essential. Whether the Commission's recommendations on appropriations is justified would require careful scrutiny.

PROTECTION AGAINST INSECTS AND DISEASE

The Commission recommends:

"That the Bureau of Entomology and Plant Quarantine, in consultation with the Forest Service and other interested Federal and State agencies and industry groups, develop as a basis for action by Congress a comprehensive program of forest-pest control, including research on forest insects and tree diseases and measures for their detection and suppression."

Comment: This has been one area where the contribution of Government has been particularly effective.

RESEARCH ON MANAGEMENT AND UTILIZATION

The Commission recommends:

"That the forest-research programs of all agencies, Federal, State, and private, be further strengthened, especially those relating to woodland management and wood utilization.

"That Federal forest-research expenditures by the Department of Agriculture should be doubled, through use of an additional $5 million annually."

Comment: While research is essential, it is questionable how much of this should be done by Government agencies in view of the fact that private agencies are already undertaking much of this work.

EDUCATION AND TECHNICAL ASSISTANCE

On page 42 the Commission recommends:

"That the Department of Agriculture's present program of technical assistance to small woodland owners and small timber processors be expanded as rapidly as practicable, with the ultimate aim of providing the staff of 2,000 fieldmen that a comprehensive advisory service would require. The expense should be shared equally by the Federal Government and the participating State governments."

Comment: This recommendation again suggests an area of diminishing returns. It is questionable how much will really be acomplished in increasing our timber resources by providing 2,000 fieldmen to call on individual woodlot owners.

PLANTINGS ON PRIVATE LAND

The Commission recommends:

"That the Federal Government's financial aid to the States for the protection of planting stock be raised to the full $2.5 million annual contribution authorized by existing law as soon as a tapering off of the need for immediate defense appropriations eases the Federal budget situation."

Comment: The Commission's recommendation that appropriations which have never exceeded $100,000 per year for Federal aid to the States and nursery programs, be increased to $2.5 million annually, is difficult to understand. Why should the Federal Government assume this additional responsibility?

FOREST CREDIT AND FOREST INSURANCE

The Commission proposes:

"That a national system of forest credit be set up within the framework of the Farm Credit Administration with loan funds initially provided by the Federal Government. The loans should be on a self-liquidating basis and the system should be organized with a view toward encouraging the participation of private banking institutions and eventual transfer of the lending function to private hands.

"That the forest-credit system, recommended above, should be authorized to develop an insurance service ancillary to its credit functions. As with forest credit, the objective should be to develop and prove feasibility of the service with a view of transferring it to private insurance enterprises as soon as these institutions are willing to enter the field."

Comment: These recommendations imply that these services will be operated by the Federal Government with a view of transferring them to private enterprise as soon as these institutions are willing to enter the field. The whole history of Government financing and insurance operations in other areas show that once such activities have been started, they are never stopped, and never transferred to private enterprise.

The report also says:

"The Commission has not been able to assess the extent of this need or to estimate the capital and running expenses that might be required at the start, but recognizes its urgency."

It would appear that these proposals are another invitation to start activities which have unlimited possibilities of draining the Federal Treasury.

FOREST TAXATION

The Commission recommends:

"That the States, as rapidly as practicable, substitute yield taxes for ad valorem taxes on timber."

Comment: This appears to be a good suggestion.

REGULATION OF PRIVATE CUTTING

The Commission recommends:

"That the Federal Government * * * lend whatever assistance it can to the States in setting up systems of compulsory regulation."

It further recommends:

"That the Federal Government should provide financial assistance perhaps up to $3 million a year on a 50–50 matching basis, to the States for administration of their laws regulating cutting."

Comment: "The mailed fist within the velvet glove" appears in the statement that "if after 5 years there still remain important gaps in the State system of compulsory regulation, Federal legislation should be enacted authorizing the Federal Government to establish minimum cutting practice regulations." It is quite apparent that the purpose of these recommendations is to further invade the police powers of the State with Federal intervention and establish additional Federal controls.

The proposal that the Federal Government should suggest the level of silvicultural work to the States and private owners should be considered in the context of the committee's recommendations on the same page:

"That the Federal Government raise the level of silvicultural work on its commercial timberland at least to the level maintained on intensively managed private forest lands of comparable value."

RECOMMENDATIONS ON FEDERAL FORESTS—ACCESS ROADS

The Commission recommends:

"That tap roads be built to give access to federally owned commercial timberlands in the West, administered by the Department of Agriculture and the Department of the Interior. Some 6,000 miles of such roads could be completed in about 5 years at a cost of about $30 million per year."

Comment: Obviously the Federal Government has the responsibility to see that these timber tracts are used to the maximum advantage. Serious consideration should be given to the possibility of leaseholders constructing these roads before burdening the Federal Treasury with an additional outlay of $150 million over a 5-year period, as recommended by the Commission.

The Commission also recommends additional expenditures for fire protection in Federal forests. There can be no quarrel with the fact that the Federal Government must protect these lands against fire.

RECOMMENDATIONS ON FEDERAL FORESTS—PLANTINGS

The Commission recommends:

"That the legislation authorizing planting of Federal forest lands be amended to extend to all denuded or partially stocked Federal forest lands capable of yielding sufficient timber to provide a good return on the funds invested.

"That appropriations be made for initiating a comprehensive planting program and carrying it forward to completion as soon as practicable in view of urgent needs for defense appropriations."

Comment: This recommendation must again be reviewed in the light of the many other demands on the Federal budget.

SUMMARY

This chapter proposes new annual outlays over and above all present appropriations for the next 5 years of $121 million, $91 million in the succeeding 5 years, and $81 million for the third 5-year period. After this 15-year period, the Commission recommends additional permanent expenditures by the Federal Government of $77 million annually. None of the costs of establishing additional credit and insurance facilities, which the Commission has recommended, are included in these suggested expenditures.

It is questionable whether equally desirable results cannot be achieved by encouraging private operators to assume many of these functions.

CHAPTER IX. IMPROVING AGRICULTURAL RESOURCES

The Commission again indulges in a specific forecast that in the year 1975 our population will have increased 28 percent, but while we will need 42 percent more food, our farms will produce only 25 percent more nonfood crops. This specific projection is immediately discounted with the following statement:

"The projected increase is necessarily conjectural. What happens will depend on the economic trends that actually evolve, on rates of technological development and population growth, as well as on the even greater imponderables of domestic and international political developments."

It is difficult to see what is accomplished by making specific forecasts which are merely conjectures.

The Commission should be commended for the following statement:

"The Nation's farmers must not only increase total production, but also provide the right proportions of a variety of products. The price structure is the main device of the economy for adjusting the 'mix' so as to provide supplies adequate to the demand for each farm-produced commodity."

It is encouraging that the Commission realizes that the price structure is the main device in our economy to adjust the mix among the many items which go into gross national product.

INDIVIDUAL FARM PLANS

The text points out that every farm should be operated under a comprehensive plan for efficient management. No one can quarrel with that.

The Commission then says:

"Relatively few farmers have such plans today: Here is a key point at which Government can help.

"The Commission estimates that not 1 farm in 50 now is covered by the type of complete plan required for consistent, long-range operation. It has not attempted to suggest the kind of Government organization that would be needed to offer assistance to all farmers in making comprehensive farm plans, nor to estimate how great a net addition, if any, this would require in the total volume of Government services."

Here again are possibilities for a tremendous army of bureaucrats to roam the country assisting individual farmers on how to run their own farms. These are the unfortunate evidences of a belief in Government planning that pervades so many sections of this report.

TYPES OF FARM CREDIT

No specific recommendations are made, but the implication in the text is that additional legislation should be enacted to permit the Farm Credit Administration and the Farmers Home Administration to grant long-term low-interest production loans. Here again, additional Government intervention seems to be the solution to whatever problem presents itself.

A RESPONSIVE PRICE STRUCTURE

The Commission should be commended for its statement:

"The chief reliance to accomplish right selection should be on the free play of market forces. It is important to have a price system in agriculture that will respond to the Nation's changing needs and call forth approximately the required production of each commodity."

The Commission also suggests:

"A more flexible method of determining relative floor prices for farm products so as to allow demand to affect price and hence supply could contribute substantially to more efficient use of land."

CARE IN BRINGING IN NEW LAND

The Commission, in opening this section, properly states:

"Much of the new land added to the agricultural base in the next 25 years will be brought in by private owners. It will be for each of them to decide whether the investment, which often will be sizable, is justified in his particular case."

Certainly land policies should be based on individual decisions rather than public planning of land use wherever possible. The Commission points out that some new "lands will be brought in wholly or in part with Federal funds, especially by drainage and irrigation projects." It suggests that "Methods of giving balanced economic consideration to the various local, regional, and national problems should be improved, partly through better coordination."

BALANCED RESEARCH

The Commission's statement on the necessity of technical research in agriculture is good. The report states:

"The Commission believes that long-range economic research in agriculture should be expanded. Work in this field can guide technical research along the lines indicated by analysis of long-range trends, and inform national programs affecting land use, and farm price or income support."

The quality of the research proposed is a determining factor in how useful this recommendation would be.

SOIL CONSERVATION

The Commission places proper emphasis on soil conservation. This chapter concludes with the following statement:

"The Commission wishes to emphasize, however, that agricultural land is an extremely important material resource of the United States. While current agricultural policies looking to preservation of this resource have in general been well devised, there are points at which public policies and programs can be improved. The Commission urges that these points should be borne in mind in reshaping public policy concerning land use."

CHAPTER X. SUPPLYING INDUSTRY WITH WATER

This chapter discusses the tremendous increase in industrial demands for water. Water is essential to so many industrial processes that it must be considered in any appraisal of our material needs.

The discussion of the water problem presented on pages 50–54 is good.

Page 55 dicusses Guides to Federal Action. The Commission states:

"The decentralized problem of industrial water supplies calls for decentralized measures. Most of the responsibility rests with industry itself, and with local and State governments and interstate agencies. The Federal Government, however, can make a considerable contribution, principally through supporting others' efforts, but also through better management of its own projects."

The Commission lists five basic principles to be followed in shaping national policy:

1. "Planning and developing water resources must comprehend all aspects of the collection, conservation, and use.

"Each major project, whatever its primary function, should be a truly multipurpose installation designed with an eye to present and prospective needs for water for all competing uses.

2. "The varied and complex problems of water can be attacked best by integrated action in each major drainage basin, under a general national policy for use of water resources.

"This Commission agrees with the President's Water Resources Policy Commission that 'Congress should direct the responsible Federal agencies to submit new proposals for water resources development to Congress only in the form of basin programs which deal with entire basins as units and which take into account all relevant purposes in water and land development.' In carrying out these proposals, it is most important that adequate consideration be given to industry's needs for water."

Comment: These two principles set the stage for legislative requests to set up new valley authorities, such as the Tennessee Valley Authority, all over the country, in other words, the Commission is advocating a Missouri Valley Authority, Columbia Valley Authority, etc.

3. "Highest economic use must be made of scarce supplies.

"Irrigation, given high priority in the past, has contributed to the economic development of the Western States, but the need is increasing for weighing the economic justification for irrigation against that of industrial use of the same water, and to compare the alternate public and private costs with public and private benefits for a given outlay.

4. "Benefits must exceed costs.

"In general, public assistance in making water available is justified only if the benefits are widely dispersed and give promise of being greater than public and private costs.

5. "Known beneficiaries should help pay for improvements.

"The identifiable direct beneficiaries should contribute to the costs of a public water project in accordance with the benefits they receive.

"The Commission believes that such payments by users in each region will help bring about maximum gains from water programs."

Comment: These last three recommendations are certainly in the public interest.

AREAS FOR FEDERAL ACTION

The Commission states:

"The Federal Government can contribute to improving and increasing water supplies in three main areas: Through research, tighter planning of programs, and cooperation in efforts to control and reduce pollution."

1. Basic studies and technological research

"Several Federal agencies study such basic components of the water supply as rainfall, runoff, percolation, infiltration, streamflow, ground-water supplies,

flood levels, and quality. These studies are of great value to industry as well as to public projects. They should be continued on a scale commensurate with growing requirements for data."

Comment: These studies are useful, but as the Commission pointed out:

"Duplication of effort, variation in emphasis, and bureaucratic competition among Federal water-resource agencies have resulted in programs that are in some aspects unbalanced and wasteful."

Comment: Research should be fostered without waste of funds.

2. *Integration of Federal programs*

"Although much responsibility lies with local authorities of the various river basins, national coordination is also necessary.

"The sound development of water resources calls for a multiple-purpose program of each river-basin development along lines that will best promote economic development and best meet the essential needs—both current and potential—of various types of water users in each basin."

Comment: This is again a justification for more river authorities, such as the Missouri Valley Authority and the Columbia Valley Authority.

3. *Abatement of pollution*

"This Commission is convinced that industrial pollution can be significantly reduced only by the cooperation of industry and Government; it also believes that to the greatest practicable extent, private sources of pollution should be eliminated at private expense.

"The Commission is impressed by the progress made, but it is convinced that ordinary market incentives will not accomplish enough pollution abatement fast enough. It believes there is need for a general strengthening of antipollution measures, including State controls, but also a need for flexibility."

Comment: Water pollution presents serious problems and the Commission is justified in recommending that the matter should receive adequate consideration at all levels of government.

The Commission discusses the Water Pollution Act of 1948 as follows:

"It declares to be a public nuisance any pollution of interstate waters which endangers health or welfare of persons in a State other than the one in which the discharge originates. In such cases, it provides for administrative hearings and court action if the State in which the pollution originates gives consent. It grants congressional sanction to interstate compacts on pollution abatement, and provides loans and grants to State, interstate, and city antipollution agencies.

"In general, the act embodies the principle that the main role of the Federal Government is to stimulate, suggest, and assist. Even in the limited area in which the National Government is authorized to compel abatement, Federal enforcement is designed as a supplement to local enforcement.

"The act prescribes time-consuming preliminaries to Federal court action, apparently to encourage local agencies either to seek enforcement in local tribunals or to cooperate with Federal authorities in working out administrative solutions. The Commission believes this is a sound approach. Readier access to Federal courts might bring quicker results but might discourage initiative and responsibility of affected localities."

Comment: The Commission should be commended for this statement which, contrary to its position in so many fields, stresses that the initiative and responsibility must rest with the affected localities, and that Federal aid has a very limited role.

LEGISLATIVE CHOICES

In discussing legislative choices, the Commission concentrates on construction loans and grants which again involve large outlays from the Treasury and more stringent penalties.

The Commission fails to mention the possibility envisioned in legislative proposals which would "encourage the prevention of water pollution by allowing amounts paid for industrial waste-treatment works to be amortized at an accelerated rate for income-tax purposes."

CHAPTER XI. PROMOTING FREE WORLD EXPANSION—THE OPPORTUNITY AND THE PROBLEMS

This chapter gives a summary of the opportunities and problems in promoting the expansion of raw materials in foreign countries. The statements shown below are taken from pages 59 to 62 of the Commission's report. They summarize the salient points of this chapter.

"The industrially advanced countries of the world are looking increasingly to the less developed countries to help meet their expanding requirements for materials.

"On the other hand, the less developed countries, with vast materials resources to develop, are bent upon a diversified development which will advance their economies and improve the conditions of life for their people. Development of their materials resources can contribute to their general economic growth.

"The basic problem of materials policy in the field of foreign resources is to determine the methods the United States should adopt to promote the production of materials abroad and, at the same time, to help fulfill the aspirations toward general economic development of the countries which possess rich resources. The United States must assume major responsibilities both of cooperation and initiative for three major reasons:

"First, this country consumes about half the materials of the free world and is the major single importer of most materials.

"Second, the United States is the world's major source of capital, equipment, technology, and management skills, all essential to promote materials production and general economic advancement in less developed areas.

"Third, this Nation believes that the economic welfare of the free world and its ability to resist totalitarian aggression go hand in hand."

SOURCES OF CAPITAL

"Historically, private capital from Western Europe and the United States has been chiefly responsible for minerals development in less developed countries. In the Commission's view private enterprise can and should continue to carry the major burden.

"But expansion of materials development is only one of the pressing needs of these countries. They need power, transportation, and other basic services, and investment for increasing productivity in agriculture—fields in which outside private capital takes little or no interest. The total need of capital is so great that less developed countries may find it wise to apply their own capital, at least for a while, to development which cannot be financed by foreign private investment, or adequately met by public loans from other nations. To the extent that they succeed in attracting foreign private capital into materials development, they will free funds for other uses contributing to their economic advancement.

"American private capital now has about $6 billion invested in materials development abroad, of which oil company investment accounts for over two-thirds. If future petroleum requirements are to be met primarily by private enterprise as in the past, investment for oil field expansion in the Middle East, Venezuela, and elsewhere will continue very large.

"Since the war United States private investment in foreign mining and smelting enterprises has averaged only about $50 million a year, although the rate has been increasing steadily since 1948. If rapidly expanding minerals requirements are to be met from abroad, it is clear that investment well in excess of previous levels will be necessary. In copper alone, for example, it is estimated that for the next 25 years an average annual investment of $100 million will be needed in the less developed countries."

BENEFITS TO RESOURCE COUNTRIES

"Minerals development and expanded production for export offer great opportunities to the less developed countries. The yield to the source country in gov-

ernment revenues and foreign exchange earnings is usually a substantial percentage of the value of mineral output and can provide the financial basis for a domestic development program. Public loans from industrial nations or international agencies are frequently available, in connection with minerals development programs, for the expansion of auxiliary facilities—railroads, roads, port development, electric power, and the like—which will increase the general productivity of the country. Mineral production, moreover, requires the development of technical skills on the part of local employees of foreign companies that are thereafter readily usable in other types of industrial development.

"If financed from abroad, minerals development diverts a relatively small portion of local capital and manpower away from other domestic activities and therefore interferes very little with other development programs in industry and agriculture."

OIL AND VENEZUELA'S GROWTH

"Venezuela is a particularly striking example of this process. The Government's foreign exchange earnings from oil amount to about $500 million annually, providing over 90 percent of the country's exchange earnings, and 60 percent of Government revenue is derived from oil. Yet only 5 percent of the labor force is employed by the oil industry. Venezuela has the means to finance a broad program of general economic development and has already undertaken major steps in improving agriculture, health, education, communications, transport facilities, and other services. Productivity is on the rise in Venezuela, providing the basis for increased domestic savings and rapid economic growth.

"The degree of improvement which materials development will bring in the economies of less developed countries depends, of course, partly on the volume of materials production and partly also on the bargains struck between foreign investors and the governments. But equally important is the use which the producing country makes of the earnings. Little perceptible progress has occurred in some countries with very large receipts in proportion to population from the exports of minerals, but in others the opportunities for economic growth have been made the most of. All resource countries with vision and determination can progress by adopting policies and programs aimed at making the best use of the opportunities for capital expansion which resource development makes possible.

"Many less developed countries seem to have a chronic distrust of relying on materials development, and also to associate raw materials production with foreign economic domination and economic instability. In south and southeast Asia, many important materials countries have recently thrown off colonial status and have taken their economic development in their own hands. In the Near East a fanatical nationalism has cast its shadow over the future expansion of foreign investment. In Latin America, independent and sensitive governments increasingly resent the stigma of economic colonialism that they often attach to the idea of heavily orienting their economies toward materials exports. All these countries appear to believe that if they want economic advancement, they should shift away from materials production and attempt rapid and diversified industrialization."

The Commission endeavors to explain the reluctance of some raw material producing countries to welcome an expansion of their resources due to their fear of market instability.

The Commission says:

"The depression of the 1930's is in the background of this distrust of materials development as a basis of economic progress. That experience of the sharp fall of incomes, foreign exchange earnings and Government revenues left in them a sense of the vulnerability of an economic position heavily dependent on export of a few price-sensitive materials. They are concerned about their ability to pursue continuous economic development programs in the face of violent short-term fluctuations of demand and price.

"These fears and attitudes are understandable. The United States and other industrial countries themselves have not fully recovered from the psychological effects of the depression. Yet, much has happened since the 1930's to alter the picture. There is every indication that the terms for trading raw materials for manufactured goods will improve over the long run. And there are sound reasons for believeing that severe and prolonged depressions of the 1930 variety can be prevented. Milder recessions such as occurred in 1949 undoubtedly can and will recur. And in the absence of special stabilizing measures, the income of materials-exporting countries would decline more than that of the industrial

countries importing the materials. This is a serious problem which must be met through national and international action to lessen instability."

The above statements are designed to make the reader receptive to price stabilization schemes recommended by the Commission in chapter 15 which will be discussed in connection with the review of that chapter.

The Commission states that raw material producing countries "are further concerned with the long-term possibility that world prices of primary commodities will fall relative to the prices of manufactured goods so that equipment and supplies will require them to export more and more materials in return." This statement should be read alongside the statement on page 84, which is quoted below:

"Producing countries fare relatively well, of course, during periods of shortages and high prices, but the same conditions impose serious injury upon many consuming countries. Great Britain, for example, after having succeeded before the Korea hostilities in moving toward a position of balance in its international accounts, finds itself again running a trade deficit which in the second half of 1951 averaged approximately $3 billion a year. Although many causes have contributed to this result, a major factor has been the sharp decline in Great Britain's terms of trade, that is, a sharp rise in prices of imports compared to prices of exports. Great Britain's economic well-being depends on her foreign trade in which, broadly, manufactured goods are exchanged for food and materials. But, largely as a result of the rearmament buildup, and the consequent speculative demand for materials, the prices of things she imports rose about 60 percent between 1949 and the third quarter of 1951, whereas the prices of her exports rose only 30 percent. To a somewhat lesser extent all the major Western European ocuntries have suffered from the impact of recent materials inflation."

The Commission correctly points out that producing countries must encourage the investment of foreign capital on a mutually advantageous basis:

"Even in countries most aware of the advantages of materials expansion and most desirous of expanding output, obstacles to development may arise out of their policies and attitude toward investment which may take the form of demands for nationalization of industry that could rule out private investment indefinitely.

"There is much evidence that investors also are deterred by legal uncertainties concerning their status as alien owners, by requirements for extensive local participation in management, and by limitations on the scope and direction of operations. Arbitrary administration of import and export controls and limitations on the convertibility of capital and earnings are regarded as other serious risks."

This chapter concludes with the following statements:

"The United States can encourage the expansion of materials production abroad both directly and in company with other nations. One route lies in attempting to improve the conditions under which private investors can operate abroad through direct negotiation with the governments of producing countries, through United States tax concessions, and through guaranties against abnormal nonmarket risks. Much can be achieved through loans and technical assistance for geological surveying and other activities preliminary to deevlopment, which set the stage for a flow of investment capital into new mining enterprises. Loans and technical assistance for the improvement of agriculture, power, transportation, ports, and other basic services can make a great contribution toward general economic advances and reduce the costs of materials development.

"Where the security interests of the free world requires rapid expansion of materials output, more direct assistance may be given through long-term contracts, price guaranties, and Government loans specifically for materials development. Other lines of attack are to reduce United States tariffs and other impediments to trade and to join in international action to reduce the instability of world materials markets."

The principal objection to the Commission's text lies in its belief that market instability can be reduced by international action such as the Commission recommends in chapter 15.

CHAPTER XII. UNITED STATES PRIVATE INVESTMENT IN RESOURCES

The first part of the chapter reviews in detail the problems which confront American investors overseas and the salient paragraphs from the first part of the chapter are given below:

"The emphasis which free countries place on developing their materials resources is profoundly influenced by their desire for broad economic and social advancement. As this ambition has clarified and strengthened, the resource countries have extended control over their resources. But to the private investor, whose technical knowledge, managerial skill, and capital are frequently indispensable, this extension of control threatens to interfere with his operations. A major problem in expanding materials production is that of reconciling the interests and rights of governments of the resource countries and private investors. Investors are losing confidence in many foreign governments and this weakens and sometimes destroys their interest in undertaking materials investments abroad.

"The risk, size, and length of term of investment tend to concentrate United States investment in petroleum and minerals development abroad in relatively few corporate hands. Nearly all United States private investment in resource development abroad has been made by a few large companies, which have been in operation for many years and have large property holdings and ample resources.

"Often companies undertake foreign ventures jointly, either to share the risk or because their special competence or market arrangements are complementary. They may affiliate with foreign companies for a particular project, as in the Iraq Petroleum Co., which is jointly owned by British, Dutch, French, and United States interests.

"Only isolated instances exist of capital syndicates formed for mining abroad. Except for buying Canadian stocks, the United States public invests in foreign mining or petroleum enterprise almost exclusively through the large corporations. Not many new concerns have started minerals enterprises abroad in recent years, and none on a scale comparable to that of established companies.

"The capital and competence required for exploration, development, and production are not easily assembled and retained without continuity of operations. The long time between initial investment and recoupment of capital requires staying power. In the case of one concession in Colombia, the first investment was made in 1916, the first discovery in 1933, and the first oil marketed in 1939, by which time over $60 million had been invested. In another instance, in Venezuela, the first investment was in 1934 and the first discovery in 1940, with almost 27 million invested before the first actual sales in 1944.

"Commission studies have clearly delineated considerable obstacles to the necessary flow of capital—obstacles that chiefly involve the attitudes and fears of investors and resource countries, the occasional conflicts between their interests, and the political and economic factors which both cause and augment these difficulties."

THE VIEWS OF INVESTORS

"When mining or petroleum companies undertake to do business in a foreign country, they do so basically because they want reserve supplies to feed their own refining and fabricating capacity, or because they find a good opportunity for a maximum return on retained earnings and a profitable way to employ their expensive technical personnel. Many investors have emphasized that the crucial investment is not capital but trained talent, which is hard to acquire and organize.

"Whatever the motivation of any particular investor, all of them share certain basic demands which must be satisfied to some degree before they will feel justified in placing capital in a foreign country:

"First, the investor wants to be sure that he can mine a particular property within the economic limits of its potential, under exclusive development rights in sufficient territory for a long enough time.

"Second, he wants to have the decisive direction and control of the development and management of the property.

"Third, he wants the full return on the output of the property subject only to normal contributions to Government.

"Fourth, and most important, he wants to be sure that the terms and conditions under which he undertakes to develop the property will not be subject to arbitrary, unexpected change.

"Given a reasonable measure of these assurances, mining companies will invest their earnings, their trained personnel, and make costly installations of equipment in a promising location when they believe that market prospects justify its development, and have reasonable assurance of converting earnings into their own currency."

OBSTACLES CITED BY PRIVATE INVESTORS

"The investor in materials development is more dependent upon the country's Government than are commercial and industrial firms. In almost all foreign countries minerals can be extracted only after obtaining government permission. In countries where the subsoil is owned by the state, the government concedes the privilege of working government property. In other countries, although the owner of the surface enjoys some rights in the subsoil, the privilege of mining or drilling depends upon contractual permission from the state as well as an agreement with the surface owner. The investor has "title," therefore, only to a privilege granted by the state under general law. Typically his rights will be defined in a concession contract negotiated with the country's government.

"Thus, the assurance of a fair chance for profitable operation depends initially upon the terms of a concession and other agreements bargained for with officials of the source country.

"Through legislation, conditions imposed in concession contracts, and administrative actions, some source countries are imposing restrictions and demands which, from the private investor's point of view, make investment opportunities less and less attractive. The most important restrictions relate to: (*a*) ownership of the corporation; (*b*) management of the concession; (*c*) taxation and other exactions; and (*d*) convertibility of currency and other regulations affecting foreign exchange and trade."

LIMITATIONS ON OWNERSHIP

"Some countries impose a legal requirement that companies engaged in extraction shall be incorporated and owned locally. In French overseas territories, insistence on majority French ownership is known to have caused recent refusals to proceed with development of attractive properties.

"The extent of ownership permissible in Brazil is not clear. The 1946 constitution appears to assure no discrimination between resident foreigners and Brazilians, but prior legislation conflicts. Many United States investors will not consider minerals development in Brazil until the right to majority ownership has been assured them."

RESTRICTIONS ON MANAGEMENT

"Local participation in the management and direction of corporations is often required by law, and sometimes sought where the law does not require it. Insistence on a French majority of directors was a major reason for abandoning the development of an African property.

"Some investors fear that local minority owners will demand too great a voice in management, or insist on uneconomic use of local supplies and personnel. On the other hand, many investors increasingly recognize that local participation is a healthy and stabilizing development which will increase government interest in the welfare of the enterprise.

"Most serious are the public pressures which limit management's freedom to determine the scope and direction of operations. The desire of source countries to build up processing and developing facilities increasingly makes such auxiliary investment necessary in order to obtain favorable concession arrangements. The desire for a local steel mill is apparent in negotiations for further development of iron ore in some countries. In others, permission to construct necessary facilities may depend upon the investor's willingness to undertake projects not connected with his operations.

"Government attitudes may limit management decisions once operations are underway. Maximizing company profits may, for example, indicate closing down a high-cost mine in one country and increasing output of a low-cost mine in another. Changes in market demand may suggest a cutback, but excessive requirements for severance pay may prevent a proportionate layoff in labor force. Company executives and government officials may differ widely in their judgment of what constitutes an economic rate of output, especially during a depressed market. The investor thinks of the particular property in relation to costs and output of properties located elsewhere, but the government thinks of its resources, leased to the investor, in terms of local employment, dollar exchange, and revenues. To some extent, any company anywhere is subject to such pressures, but most greatly when the main source of revenue for a country, and perhaps a main source of employment, is a single petroleum or mining operation.

"Other limitations on management decisions, reported by investors, are fixed requirements for the employment of local labor and technical personnel; training to qualify citizens for skilled positions; high severance pay and retirement benefits; and large payments in the event of shutdown. These requirements add costs which have sometimes discouraged investment."

TAXATION AND OTHER EXACTIONS

"Metals mining is often subject to gross production or sales taxes which make no distinction between high- and low-cost properties. The tax imposed without regard to the investor's costs magnifies the inherent risks of minerals development. The investor's troubles may be further compounded since such taxes will probably not be allowed as a credit against his United States income-tax liability.

"How the tax is determined is of just as much concern to concern to investors as the rate. Before 1950, investors were deterred by Peru's high tax based on value of exports. But since Peru's passage of a new mining code in 1950, computing the tax on the basis of net income, investors have renewed expansion and development plans.

"The investor is also concerned about when the tax is imposed. Canada and Australia have stimulated new mining activity by allowing deduction of exploration expenses and postponement of taxes. South Africa has promoted development by permitting rapid amortization of original and subsequently invested capital in the computing of taxable income Some investors point to this tax pattern as a primary reason for their decision to invest in South Africa. The new Peruvian code offers the possibility of negotiating partial tax postponement."

CONVERTIBILITY AND EXCHANGE RATES

"The cost of doing business in a particular country may often be increased by multiple exchange rates. By requiring an unfavorable rate for converting profits to dollars, or by requiring conversion of dollars to local currency below the rate in effect for other purposes, the government may exact funds from the investor. For example, United States copper companies in Chile were required in 1951 to purchase pesos for operating expenses at a rate of 19.37 to the dollar as compared to rates ranging from 31 to 94 pesos in other transactions. The unfavorable rate is an acknowledged device for taxing the copper companies. A new arrangement providing alternative forms of taxation has been negotiated and is awaiting ratification by the Chilean Congress.

"Since the materials in which United States industry is most interested are marketable for dollars, mining investment may be less impeded by exchange restrictions than investments dependent on local or other soft currency markets. However, obtaining advantage of the dollar earning powers of minerals depends upon the administrative favor of the resource country's government.

"United States corporations state that their doubt whether they can convert local currency to dollars is a major deterrent to investment in some countries. Brazil limits conversion of earnings for remittance to the United States in any one year to 8 percent of the investment. This limitation may become more serious. A recent Brazilian ruling excludes earnings reinvested in development in computing the 8 percent for transfer to the United States and requires retroactive recalculation of the capital base to eliminate such reinvested earnings."

IMPORT AND EXPORT CONTROLS

"In many areas allocation of sales between local and foreign markets is restricted by export controls. Many investors regard export regulations as a major block to efficient operations, particularly when the indirect object is to enforce local processing and fabrication or to enable the government to control a portion of sales in world markets.

"Many countries give mining companies preferential treatment for imports of equipment and supplies, but some impose restrictions. As a rule, investors regard import restrictions as a nuisance rather than an obstacle. However, small investors have abandoned concessions because of being forced to use inferior, costly local supplies and equipment."

FEAR OF EXPROPRIATION

"Beyond the obstacles so far cited lies a more general and perhaps more important deterrent—the investor's fear that he will be dispossessed of his property by arbitrary action of the resource country or his interests so encroached upon as to destroy his investment.

"Governments have rarely enforced forfeiture without cause, as a 'sovereign right.' But some have done so with the allegation that the investor had failed to abide by the terms of the agreement. The opportunities for governments to make such allegations are as many and as broad as the terms and conditions imposed upon the investor. Mining concessions commonly stipulate that investors shall maintain a prescribed rate of development and extraction with the reasonable objective of protecting the country's interest in having its resources developed rather than hoarded. Hence, forfeiture enforced because of failure to work the concession at an adequate rate would be in accordance with the terms of agreement.

"But if shutdown of a property can entail forfeiture, then any action by the government making the property unworkable or unprofitable over a period of time carries with it a threat of such 'creeping expropriation.' The interruption of publicly owned services—transportation or power—on which an enterprise depends may halt operations or even make the property untenable. Radical increases in labor costs and taxes imposed by new laws may change a profitable operation into a losing one. And no matter how great his difficulties the investor fears that by discontinuing production so as to ride out a bad period, he may lose his concession and the bulk of his investment. The threat of this type of squeeze, and the knowledge that any alleged violation of contract will be reviewed, if at all, in the courts of the complaining country, haunts the investor more than the danger of outright nationalization."

OFFICIALS' ATTITUDE

"Any investor finds that the requirements and risks of operation involve a far greater dependence on the favor of the country's government than he is accustomed to in the United States. The terms of ownership, management, taxation, and currency convertibility may be differently interpreted under different administrations and may be radically altered during the long course of development and production. This placed the investment literally at the whim of the state. In Latin America, Afria, and Asia, the state means individual officers who exercise a far more personalized control than in this country. The high degree of dependence upon the attitude, actions, and discretion of these officials is a crucial distinction between foreign and domestic mining investment and operation.

"Investors point explicitly to hostile statements by heads of certain countries as reason enough for staying out of those areas, and cite similar official statements and policies in others. Almost all United States investors interpret present Argentine policies as consciously inhospitable. Past actions of some countries, hostile to foreign investment, discourage new investment. Chile recalls earlier memories of the nationalization of all nitrate marketing, and Mexico and Iran symbolize oil 'expropriation.' Misgivings are aroused by nationalization of domestic industries in some source countries. Even when the investor has confidence in the good intentions of incumbent government officials, he still must be concerned with the unknown attitude of governments yet to come."

PENALIZING SUCCESS

"Quite apart from whether governments prove hospitable and reliable, the interests of the investors may diverge from those of the source countries. A bargain favorable to exploration and initial development may seem unreasonable or unfair to a later government when resources are paying off. To the investor a 'fair' return on many long-shot failures requires a full return on the one brought home."

OPPORTUNITIES FOR SOLUTIONS—THREE MOVES BY INVESTORS

The Commission lists three moves by investors which can be effective. They are:

"First, investors are making a conscious and marked effort to encourage local participation in management and operations.

"Second, investors have improved relations with governments through local equity participation.

"Third, investors have attempted to forestall conflicts of interest which have arisen in the past. In the petroleum industry the 50–50 formula has been developed."

The Commission concludes with this statement:

"None of these efforts toward more reliable and more predictable arrangements will succeed so long as a basic lack of mutual confidence exists, but economic statesmanship will help. Companies cannot treat foreign concessions as reserves to be brought into production only when it suits the narrow objective of maximizing profits for the company. Operations must contribute to the economic and social well-being of the country. A concession country has a right to the efficient development of its resources at a rate commensurate with its national interest as well as with the reasonable interests of concessionaires."

HOW UNITED STATES GOVERNMENT CAN HELP

The second part of the chapter deals with the steps the United States Government can take to further foreign investment.

The Commission first discusses investment treaties. These treaties should be the principal device to further American participation in the development of the free world's resources. The Commission makes the following statements regarding investment treaties.

"The investment treaties of today are modern versions of the Treaties of Friendship, Commerce, and Navigation (FCN treaties) with strengthened provisions covering the rights of investors and security of investments. The treaties bring economic relations between nations within a framework of law and, since they are long range, are particularly appropriate for the problems of materiasl development.

"Even if all treaties provided unqualified national treatment for United States investors abroad, they would still leave the investor subject to a variety of restrictions and impositions. In many foreign countries, particularly in less developed areas, governments recognize the key role which materials development and production play in their economies and therefore subject such activity, whether conducted by foreigners or their own nationals, to close and direct government supervision. In other countries, restrictions on private investment in such fields as petroleum have been adopted because these activities are regarded as sensitive from the security standpoint. Even where the general mining law under which concessions are granted does not discriminate against investors from the United States or other countries, it often permits considerable administrative latitude in granting a concession, or on a concession's terms.

"Despite its shortcomings, the investment treaty does offer the promise of protection against expropriation without prompt and just compensation—a protection supported by provisions that unresolved disputes over interpretation of the treaty shall be submitted to the International Court of Justice, unless the parties agree to settlement by some other pacific means.

"The Commission is aware that investment treaties will not in themselves induce materials development. Nevertheless, it supports the program as helping to give investors confidence in the intentions and policies of other governments. Special raw materials agreements with particular countries should be undertaken in addition to efforts to negotiate comprehensive instruments like investment treaties."

The Commission discusses special resources executive agreements. It recommends:

"That executive resource agreements with other governments should be negotiated when there are clear indications that new investment in minerals enterprises would take place in a particular country if legal and administrative deterrents were lifted."

This recommendation must be considered in the light of the text which includes this statement:

'In the contemplated special resource agreements, the resource country's government would pledge its cooperation in removing the uncertainties which chiefly deter investors, in return for guaranteed prices or purchase commitments by the United States Government, plus an assurance that the United States would facilitate investment in both resource and general economic development.

"Agreements of this general character were negotiated with a number of Latin American countries during the last war, after European markets were cut off. Guaranteed purchase of minerals at stated prices was a strong inducement. Under present market conditions, producing countries might find it less persuasive. Other attractions can be added—the promise to encourage private investment, and to facilitate loan assistance for developments not directly connected with materials projects, such as power, transportation, and agriculture.

"The special resource agreements would be executive agreements rather than treaties."

These statements are disturbing in that they again commit the United States Government itself to guarantee prices of materials or make purchase commitments. Our aim should be to negotiate treaties under which private enterprise can operate without such guaranty, except for those specific cases where stockpile and military security require direct Government intervention.

The Commission discusses investment guaranties. Such guaranties are designed to protect American investors against expropriation and to guarantee the convertibility of foreign currency earnings into dollars. The Commission conclusively shows that such guaranties will not stimulate the needed investment. It says:

"Although by the end of 1951 the program had been authorized for nearly 4 years, only 34 convertibility guaranties totaling about $32 million had been issued, and only 2 guaranties against expropriation totaling about 1.3 million—a small fraction of the funds authorized for these purposes. None of the guaranties involved investments in extraction or smelting and although applications have been made on behalf of a few mining enterprises, at the end of 1951 none had resulted in a guaranty contract.

"On the record the effect of convertibility guaranties in inducing investment is open to question."

The last part of this chapter deals with the question of taxation. Most of the suggestions are sound. It recommends:

1. "That the taxpayer be permitted to elect annually whether the 'per country' or 'overall limitation' will apply in computing credits for taxes paid abroad.

2. "That deferral of reporting income from overseas branches until the income is remitted to this country be permitted, as is the case with subsidiaries.

3. "That domestic corporations with foreign subsidiaries be given the same rights to file and obtain the benefits of consolidated returns as affiliated domestic corporations have.

4. "Exemption from tax of income earned abroad by United States citizens is an important means of encouraging participation of technical and managerial personnel in foreign development.

5. "That taxpayers be permitted in computing the portion of their dividends that represents taxable earnings to make a deduction corresponding to their share in the foreign corporation of the same outlays of the corporation for exploration and development as domestic producers are permitted to make and to treat that deduction as a return of capital rather than as taxable earnings."

This chapter concludes with a discussion of tax treaties to provide investment incentives. The Commission says:

"Bilateral tax treaties offer an additional means of eliminating double taxation, and of promoting foreign investment through selective offering of special favors.

"As presently drawn, the treaties are designed to eliminate taxation of the same income by more than one country. They reconcile the legal and administrative concepts of the contracting countries and establish a mechanism to which the taxpayer can turn in case of dispute.

"The Commission believes that exemptions of income earned abroad from United States taxes through bilateral convention is an appropriate device for stimulating United States investment in countries where the potentiality of materials development is high. The exemptions granted through bilateral conventions by the United States should be confined to new investment whether in the form of new enterprises or the expansion of existing ones.

"Countries can be selected where these criteria are met: Where the output potential is high for materials which the free world lacks; where the political context is such as to induce new investment through tax advantages; and where the other country pledges itself to establish tax and other arrangements favorable to United States investors."

The Commission quite properly recognizes that:

"Tax legislation in the United States is the concern of the entire Congress and in particular of the House of Representatives. Treaties need the approval only of the Senate but the Commission feels that any substantial changes such as proposed here in the content of the tax-treaty program should secure legislative authorization from both Houses of Congress before being undertaken."

The Commission concludes this chapter with a good statement reaffirming its belief in competition as the best regulator of economic activity, while recognizing that the development of mineral resources abroad will always be in relatively few corporate hands. It says:

"In keeping with its confidence in competition as the best regulator of economic activity, however, the Commission urges continuation of the traditional policy of this Government in opposing restrictive practices at home and abroad. This policy has been manifested in the bilateral agreements governing Economic Cooperation Administration assistance to Europe and in the positions taken by United States representatives on the Economic and Social Council of the United Nations.

"Although development of mineral resources abroad is in relatively few corporate hands, to a very considerable extent the fewness, size, and power of foreign minerals producers and processors appears to lie in the nature of the business. Insofar as compatible with efficiency and continuity of operations, however, it is desirable that more investors as well as more investment be attracted into the foreign field. The Commission believes that its proposals concerning investment treaties, special resources agreements and, in particular, tax reform may provide a substantial inducement to new as well as present investors."

It concludes the chapter with this statement:

"The steps which the Commission has recommended can accomplish much to promote private investment in materials production abroad. But there are strict limits to what the United States Government can do. In the last analysis it is the private investor himself and the Government of the source country who are the principal parties of direct interest. Much will depend on the understanding and sense of public responsibility displayed by private investors toward producing countries. And, on their part, the producing countries will have to demonstrate in specific and practical terms that they are aware of the great contribution which materials development can make to their general welfare."

CHAPTER XIII. DIRECT ASSISTANCE BY PUBLIC AGENCIES

This chapter deals with two separate problems, first the role which the United States and the United Nations, with its specialized agencies, can play in assisting underdeveloped countries to provide a favorable environment for the private-enterprise development of their mineral resources, and second special measures for security needs. An analysis of each section follows.

TECHNICAL AND FINANCIAL ASSISTANCE

This section discusses the role of public agencies in creating a favorable climate for private investment in mineral industries. The Commission says:

"While the Commission believes that private investment must be the major instrument for increasing production of materials abroad, it also believes there is immediate and continuing need for public action beyond efforts to assist and encourage private investment. Private enterprise cannot be expected to undertake many types of activity and investment which must accompany or precede the establishment of new materials projects in the less developed areas of the free world. The technical and financial aid which is needed can and should be given by the United States Government and international organizations. Security needs of the free world require public action in addition to private action to assure that essential materials will be produced at the right time and in the right quantity. In this chapter the Commission discusses two major types of direct public assistance abroad for this purpose."

The Commission shows the possibilities of expanding the economy of a country by properly directed United States assistance. It says:

"The Commission believes that public development loans can increase foreign materials production best by financing such public improvements as transportation, power, and port facilities. Without these, expansion of materials output is often impossible.

"United States interest in the development of friendly countries is by no means limited to their materials production, but since materials can yield foreign-exchange income, a country's willingness to support effective resource development might be an important factor in assessing the country's ability to service additional loans for economic development.

"The Commission is convinced that international agencies should take a major part in providing technical and financial assistance for economic development. It has some important advantages over direct aid from the United States. International action may frequently be more effective than that of a single nation in inducing the less developed countries to adopt necessary, but politically difficult, domestic measures."

The Commission believes that the United States Government is permanently committed to the development of the economy of other countries. It suggests that we furnish aid in topographic and geologic mapping. It says:

"Topographic and geologic mapping are indispensable first steps in minerals development. In the United States, geologic surveys together with a limited measure of preliminary exploration are performed by the Federal Government to lay the groundwork for private operations. Underdeveloped countries, on the other hand, typically lack the skilled manpower, the equipment, the facilities, and even governmental agencies, for appraising their mineral resources. Yet, without this preliminary work, neither substantial private investment nor comprehensive governmental development programs can be expected to get started.

"The current United States programs of technical aid give assistance to some resource countries in all these respects, through geological and exploratory work by United States experts, through help in organizing local minerals and geologic bureaus, and through training local experts.

"It is beyond the competence of this report to recommend in detail the amounts of grant or loan assistance needed for economic development or the specifics for rendering such aid, but the Commission calls attention to the fact that the United

Nations Technical Assistance Board thus far has spent only about $100,000 on direct assistance for minerals development—in part a reflection of lack of interest among underdeveloped countries.

"It is the Commission's view that the United States representatives should encourage a wider use of United Nations technical assistance in geological surveying and minerals exploration in the underdeveloped countries."

SPECIAL MEASURES FOR SECURITY NEEDS

The second part of this chapter is devoted to "certain direct activities which the United States Government must undertake abroad for security purposes." The statements below may be challenged on many grounds. The Commission states:

"Private capital responding to normal market incentives may not bring about materials development and production fast enough or large enough to meet security needs. No matter how successful governments may be in improving the situation for private investment, continuing risks and uncertainties may prevent the necessary volume of investment. But to the Nation, these risks are outweighed by the compelling need for defense production, for stockpiling, and for maintaining an economy capable of rapid expansion for wartime production should this become necessary.

"An existing high level of defense demand might not be maintained long enough to warrant additional investment. An abundance of low-cost supplies in hostile hands, as in the case of Chinese tungsten or Soviet manganese, might be used to flood markets and choke off sales from new capacity.

"For security reasons the Government may want to promote development of standby capacity, or to encourage production in a relatively high-cost area judged safe from aggression—neither economical by private market standards. In other cases the prospects and costs may be too conjectural to be worth a private gamble on the political and strategic hazards in a foreign area."

The Commission is apparently not impressed by the necessity of attempting to induce marginal production within the United States with tariff assistance. Such production would give greater security as it would avoid the transportation of materials through submarine-infested oceans if war should come.

"Before the Government steps in with direct assistance in any of these cases, it is important to be sure that the public interest is clear and compelling and that private action alone could not be relied on. In some materials industries, such as the petroleum industry, private enterprise largely unaided financially by Government has been successful in expanding foreign production to meet free-world requirements, even in the face of substantial obstacles. Widespread assumption of market risks or of financing by the Government might reduce private initiative until private capital would not venture abroad without special Government inducement or favor. Officials operating Government programs of direct assistance must, therefore, satisfy themselves in each case that the necessary increase in production cannot be achieved without special Government action."

The Commission says "the Government can use a number of techniques in promoting the expansion of foreign materials production. These include long-term contracts, development loans, Government ownership with operations under management contracts, and Government ownership and operation of foreign properties." All of these "involve a shift of market or production risks from the investor's pocketbook to the Treasury of the United States."

Long-term contracts and development loans were used to expand foreign production. It appears that prices paid for foreign production exceeded that offered to domestic operators. It is difficult to see how such procedures could be justified as a larger domestic output could have been obtained during the Korean period if the United States producers had been offered more favorable prices. When the Defense Materials Procurement Agency uses these contracts to purchase materials for resale to private industry, the Government is then using the taxpayers' funds for stabilization purposes and not for defense. This is contrary to the whole philosophy of the original Stockpiling Act. In view of the criteria established by the Commission which have been quoted above, it is difficult to see why the authority granted under the Defense Production Act to the Defense Materials Procurement Administration to purchase materials for resale to private industry should be continued beyond the present emergency. The Commission recommends that:

"A successor agency should be established whenever the Defense Materials Procurement Agency is dissolved, and that it should be empowered to make long-term contracts for periods up to 10 years for foreign-produced materials, including standby contracts and price-floor arrangements."

This recommendation is predicated on the statement that:

"The authority of the Defense Materials Procurement Agency and its funds are established strictly on an emergency basis; that of the General Services Administration is limited to stockpile operations against limited objectives. The task of increasing production of materials for security purposes—both to provide for stockpiling and, of equal importance, to provide a continuing and expansible flow of scarce materials—does not, in the Commission's view, have a foreseeable end."

It would seem that when the stockpile goals have been achieved, the Defense Materials Procurement Administration should be dissolved and no successor agency should be established. The Commission, in effect, is recommending permanent Government intervention in the materials markets of the world, with these recommendations.

GOVERNMENT LOANS

The Commission recommends:

"That a successor agency should be established whenever the present emergency agencies are dissolved, and that it should be provided with funds for financing foreign materials production in cases where special United States security interests justify assumption by the Government of greater risks than would be assumed by the Export-Import Bank in its normal operations. It is the view of this Commission that the Export-Import Bank should not lower its normal standards in making such loans out of its funds.

"That in general Government loans for materials production be limited approximately to not more than 50 percent of the total investment required for the desired expansion of output. In exceptional cases, where it is impossible to attract private capital for 50 percent of required investment, public lending agencies might provide perhaps as much as 75 percent of the total capital."

These recommendations must be considered in the light of the Commission's statements which appear below:

"At present the Defense Production Administration is authorized to make funds available (by certification to the Export-Import Bank) for materials development loans, advances, and loan guaranties to producers abroad, but up to April 15, 1952, had used its authority in only one case—a sisal development in Haiti—though others were pending."

Since such loans have had so little use during the present emergency, it is difficult to understand why a successor agency should be established to carry out such programs when the present emergency agencies are dissolved. Presumably, they will not be dissolved until the present emergency is over and under normal conditions such loans which by definition do not meet banking standards should not be made at the expense of the taxpayer.

DIRECT GOVERNMENT PARTICIPATION

The Commission recommends that under the exceptional conditions outlined in the text, direct Government participation may be necessary. It specifically recommends:

"That profit-sharing debentures be obtained by the Government when Government loans for materials development exceed 75 percent of the total investment.

"That legislation explicitly authorizing the Government to enter into management contracts for foreign materials expansion be enacted by the Congress."

Such direct Government participation in development work should take place only if it is necessary to meet specific national defense or stockpiling needs. No Government participation should be authorized that does not provide for a means of transferring the operation to private enterprise when the specific emergency is over. The Commission closes its discussion with this statement:

"In sum the Commission has recommended that after the current emergency agencies are disbanded, a permanent agency, or agencies, be established whose powers would include the following: (*a*) to make long-term purchase arrangements including price guaranties; (*b*) to provide funds for foreign production loan assistance in situations where the risks to the lender are such that loans could not be made with Export-Import Bank funds under its normal standards; (*c*) to enter into management contracts, or to make loans which provide for a

sharing of profits in cases where the proportion of the total capital represented by Government financing exceeds approximately 75 percent.

"It is again emphasized, however, that these operations should be confined to situations in which the material or the productive capacity is required for reasons of compelling national interest and cannot be obtained without special governmental action of the type discussed in this chapter."

It is difficult to understand what compelling national interest would require these actions after the current emergency agencies have been disbanded. They will obviously not be disbanded while the emergency exists. The emergency will be over when our stockpiling objectives have been met and we have a military posture that will make attack by any other nation or groups of nations unlikely. Under such a condition the Commission's recommendations can only be justified if one accepts the premise that the door should be open to Government intervention in the mineral industries whenever Government officials think such intervention is in the national interest. It would be far better to deal with any situation that might arise through specific congressional action rather than to delegate these powers to a permanent Government agency.

CHAPTER XIV. REMOVING BARRIERS TO TRADE

This chapter starts with the premise that no unnecessary obstacles should prevent the maximum expansion of world trade. The Commission applies this premise to justify repealing our tariff laws as well as the Buy American Act, and it then jumps to the completely unsupported conclusion that a device such as the International Materials Conference, will remove barriers to trade. The congressional debates in the 82d Congress on the International Materials Conference show the fallacies in this approach.

A detailed discussion of this chapter followes under the chapter headings in the Commission's report.

RELIEVING TARIFF RESTRICTIONS

The Commission concedes that the Reciprocal Trade Agreements Act of 1934 and its extensions have reduced the tariffs specified in the Tariff Act of 1930 for many materials. The Commission says:

"These reductions undoubtedly help to lower the barriers to trade, but the size of duty on a particular material does not necessarily suggest its full influence in restricting imports. The degree of effect would vary with other economic conditions. In slack times, even a very low duty might strongly discourage imports. On the other hand if the United States did away with price controls, and industry's demand kept growing, import duties might have only small effect in restricting the flow of materials, although they might still discourage new development abroad. At present, when prices are controlled, even a low duty makes the prices offered in the United States less attractive to foreign producers than those of competitive world markets with uncontrolled prices."

Obviously if we are to have slack times, then we must expect unemployment in the mineral industries. Under such conditions, it is unrealistic to suggest that we encourage imports of these materials and put our own people on relief. This is exactly what the above statement suggests.

When times are good we certainly should do away with price controls which have complicated all our material goals. As the Commission admits, when times are good import duties will have little effect in restricting the flow of materials.

The Commission raises an interesting point in connection with the higher duty on processed material:

"The typically higher duty on processed materials, as contrasted with ores or crude materials, presents another case in which the tariff schedule does not necessarily serve the best interests of the Nation. The ores of such minerals as antimony and chrome may be imported duty free, but the metal is subject to tariff; the same discrimination is applied to lead, manganese, petroleum, and aluminum. Yet, unless the country in which processing would take place is judged too vulnerable from a security standpoint, the processing of ores abroad could be to our national advantage. This would be true whenever foreign processing costs, in conjunction with the lesser charges for shipping more concentrated processed materials rather than bulky ores, would actually deliver lower-cost materials.

"To encourage imports of processed materials would be especially desirable when labor, transportation, and power continue short in the United States."

There can be no quarrel with the economics involved. Certainly we should encourage the importation of concentrated materials so as to reduce shipping charges. However, such decisions cannot be made without considering the effects on domestic producers. The Commission concedes that:

"One of the pleas offered for continuation of tariffs is based on security; the argument advanced is that tariffs will assure continued operation of domestic mines or plants needed in wartime but too high cost to compete in a peacetime market.

"In the Commission's judgment, there would be few cases where a protective tariff would be the best device for satisfying security needs. For security, as

for economic growth, the principle which the Commission advocates is to find the lowest cost way of meeting a need. Lower cost ways of accomplishing the same end are suggested elsewhere: Stockpiling in chapter 28; expansible capacity in chapter 29; long-term contracts and similar devices in chapter 13."

Here again the Commission is recommending direct Government intervention with long-term contracts and similar devices rather than a tariff.

The Commission finally throws all discretion to the winds in its conclusions and recommendations.

"The overriding national interest points clearly to the desirability of eliminating the obsolete tariff barriers to the entry of materials into the United States.

"The Commission believes that the reciprocal trade program should be carried forward and its authority expanded. However, there are limits to the technique of reciprocal trading. It is bound by the very principle of reciprocity:

"The Commission believes that elimination of the tariff on many industrial materials would be of benefit to the United States, quite apart from reciprocal action by other countries.

"That permanent legislation entirely independent of the Reciprocal Trade Agreements Act be enacted authorizing unilateral elimination of import duty on any industrial material in either crude or refined form whenever it is determined that the United States is, or is expected to become, substantially dependent on imports of the material, and that such action is in accord with the national interest. Procedures for making such determinations should be specified in the legislation."

The Hull reciprocal trade agreements program had wide acceptance because it was supposed to be a reciprocal program. The Commission now proposes a unilateral withdrawal of tariffs and apparently suggests permanent legislation which would delegate tariff making powers from the Congress to the Executive. This is an extreme measure and there is no evidence that such a proposal is justified.

BUY AMERICAN ACT

The Commission admits that the Buy American Act of 1933 was enacted when production was slack and millions were unemployed. Certainly if we again have unemployment in this country, the American people will rightfully expect the United States Government to use our taxpayers' money to purchase articles available in the United States rather than elsewhere. Yet the Commission says:

" * * * the Buy American Act requires the Government to purchase domestically produced materials unless the head of a purchasing agency or department determines that such purchases are inconsistent with the public interest, or the cost unreasonable, or the material unobtainable in the United States in adequate quantity and quality.

"A 'Buy American' provision also applies to purchases of materials for the strategic materials stockpile.

"That the Buy American Act and similar provisions of State and other Federal law and regulations be repealed."

Under conditions of full employment there will undoubtedly be many instances under existing law where the head of a purchasing agency would certify that materials were unobtainable in the United States in adequate quantity and quality at reasonable costs.

The Commission shows that the Buy American Act provisions also apply to purchases of materials for the strategic materials stockpile and that this provision has been interpreted as permitting purchases from domestic producers if the price is as much as 25 percent above foreign offerings.

The Buy American Act was inserted in the stockpile law for the specific purpose of encouraging domestic production of strategic materials so as to decrease our vulnerability in the event of war. To scrap these provisions would represent a drastic change in our fundamental defense planning. The Commission has given no valid reason why this should be done. The Commission is strangely silent in regard to the Walsh-Healey Act which provides minimum standards of wages and working conditions for Government contractors. It is inconceivable that the Buy American Act could be repealed with the Walsh-Healey Act still in effect. If this proposal were adopted, it would mean that foreign producers not subject to the Walsh-Healey Act could underbid United States contractors and take all the business away whenever times were slack. Furthermore, the Commission recommends repeal of the Buy American Act without suggesting any reciprocal advantages for the United States. The Buy American Act was adopted long after Britain and other countries had employed similar devices to promote

the interests of their nationals. This act certainly should not be repealed without a provision for negotiating reciprocal actions by other countries.

EXPORT CONTROLS AND ALLOCATIONS

Export controls and allocations should have no permanent place in our economy. They have been adopted for two reasons:

1. To prevent strategic materials reaching the hands of our enemies.
2. To protect the domestic economy of this country from an excessive drain of scarce materials and finished products.

The Commission, on page 77, suggests that we should:

"Govern export controls and allocations so that supplies and equipment move to primary resource countries which wish to increase their production of needed materials."

On page 81, the report says:

"Under the pressures of administering an allocation and export control program, the importance of projects abroad which produce materials needed during the emergency is apt to be more clearly recognized than that of long-range development.

"The Commission wishes to emphasize that if allocation and export controls are not to limit foreign materials and general economic development, the present policy of providing adequate allowance for supplies and equipment not only for existing producers abroad, but also for materials and general economic development which is for the future, must be vigorously carried out."

The Commission is strangely silent about the necessity of providing material for the economic development of the future of this country during such a period. While none of us wish to curtail opportunities abroad, it is difficult to believe that the Congress intended export and allocation controls to be used in this manner.

A PERMANENT INTERNATIONAL MATERIALS CONFERENCE

The tditle of this chapter is "Removing Barriers to Trade," yet the Commission endorses the activities of the International Materials Conference, which has allocated the world's materials among all the countries of the free world. Although the Commission has given frequent lipservice to the importance of the price mechanism, as well as to the paramount importance of building our own defense, it makes this amazing statement:

"Soon after the outbreak of the Korean war materials were at a premium. Worldwide demand soared, and raw material prices became a major inflationary threat. The acute shortages of some materials aggravated international tensions. The inability of Western Europe to obtain enough American products like cotton and sulfur held back essential industries and caused resentment. The United States stockpile program was severely criticized abroad for 'shorting' the rest of the world. The United States, in turn, resisted paying prices deemed excessive for materials produced in sterling areas and elsewhere. It is clear that materials distribution in emergencies is an international problem, calling for international machinery."

Certainly there can be no reasonable grounds for resentment against the United States in view of the fact that:

1. This country has assumed most of the load in Korea.
2. It is supplying a large part of the hard goods to the NATO forces.
3. Materials cannot be effective as weapons for the defense of the free world in the hands of backward peoples who do not have the facilities and trained personnel to produce armaments.

The Commission makes the following statement in reference to the International Materials Conference:

"The International Materials Conference is an emergency organization established to meet an immediate problem. It has made a substantial contribution to the orderly distribution of world supplies of currently scarce materials, and indirectly to the stabilization of raw-material prices.

"For the longer run, there will be a continuing need to maintain statistics on world demand and to appraise the adequacy of existing and planned production to meet it."

The Commission therefore recommends:

"That statistical surveys of materials demand and production be maintained by the United Nations and its specialized agencies, and that when individual

commodities present world problems which appear to justify such measures, separate international study groups be set up comparable to those existing for wool, rubber, and tin."

This recommendation can only be interpreted as a recommendation for a permanent International Materials Conference under United Nations' auspices. This is as far from the free market as one could get.

In summary, chapter XIV suggests that we remove all United States restrictions on imports through tariffs; that we abandon the Buy American Act; that we favor the long-term interest of other countries in administering export controls, presumably at the expense of our own economy, and that we sponsor a permanent International Materials Conference under United Nations' auspices to allocate materials to us.

It is difficult to find anything in this chapter that merits support. This is unforunate as the chapter heading, "Removing Barriers to Trade," is a theme which most Americans would like to support. Support would demand a program of reciprocal action on the part of other nations which the Commission ignores as well as a renunciation of controls and United Nations study groups which are accepted by the Commission.

CHAPTER XV. REDUCING MARKET INSTABILITY

This chapter, like chapter XIV, is a justification for the State Department's postwar trade policies which were embodied in the Habana Charter. It is significant that this chapter died in the hands of the House Foreign Affairs Committee during the 81st Congress. Nevertheless, the Commission has the audacity to state:

"The United States has not ratified the treaty, but under a resolution of the United Nations Economic and Social Council is bound with other nations to recognize chapter VI as a general guide."

The thesis of this chapter is that market instability in raw materials prevents the maximum development of the world's resources, retards investment in mineral properties, and limits economic development. The Commission states:

"Prices of most materials tend to react sharply to small shifts in supply and demand. When business declines, the fall of materials prices is extreme; when times are good, materials prices rise higher and more rapidly than do others.

"Even such comparatively mild fluctuations of the world's business cycle as occurred in 1936 and 1938 and in 1949 produce severe declines for materials prices and production. During the business expansion from 1936 to 1937 the increase from the lowest price in 1936 to the highest in 1937 included such rises as 91 percent for rubber, 100 percent for copper, 66 percent for tin, and 99 percent for lead. In the following year prices plunged downward again and, at the low in 1938, rubber prices were off 60 percent from the high, copper off 48 percent, tin 45 percent, and lead 53 percent. More recently, during the 1949 business contraction, the price of zinc fell from 17.5 cents a pound in December 1948, to 9.5 cents in June 1949—a drop of nearly 45 percent."

It is significant that even though we have an avowed objective of eliminating depressions, the Commission recognizes the contraction which occurred in December of 1948 through June 1949.

A question may be properly raised as to whether the contraction from 1936 to 1938 could be described as a comparatively mild fluctuation of the world's business cycle. Most observers would describe the economic change in the United States during this period as one of the sharpest fluctuations we have ever experienced.

The report continues:

"There can be small question that investors hesitate to enter a long-term development when extreme market instability makes them unsure of profits; total production must suffer to the extent that materials are not extracted from the earth because of this. Equally, when the risk is great, investors want a higher return on their capital to make the risk worthwhile, which tends to increase prices.

"Records show that the production of minerals falls off sharply when prices sag; if the prices stay below profitable levels output is curtailed and the labor force drifts away. If the low-price period continues long enough, mine maintenance may be neglected, close-downs occur, and the property may ultimately become impossible, or too expensive, to put back into operation. As a consequence of such developments as these, the rate of production will recover more slowly when prices rise again. The operators first will want to be sure that the market will stay up long enough to make it worth their while to undertake expansion of operations especially where reopening is involved. The labor force may have to be rebuilt and neglected maintenance made up for. Some copper mines shut down in the United States in the 1949 recession are only now beginning to produce again. The Leadville district in Colorado was shut down in 1933 and the lead mines eventually became flooded. Although prices later improved, private capital did not attempt to reopen the mines. In 1941, the Government decided to cut a tunnel to drain the area. Several million dollars have been spent and the project is not yet completed."

Certainly the Commission cannot be recommending a stabilization scheme with sufficient resources to maintain prices and production for a district such as Leadville during a period of national depression, yet that is the implication of

the statement quoted above. Actually tariff protection would have been the cheapest way to protect such a district. The Commission recognizes the futility of such steps when it says on page 84:

"It would be futile, of course, to attempt to stabilize materials markets unless general business cycles could first be prevented from repeating the destructive gyrations of the boom of the late 1920's and the prolonged depression of the early 1930's. Government and industry are alive to these dangers and to the necessity for prompt and sweeping action when they threaten. Major weapons have been devised and used in crisis. There is good reason to believe that if Government and industry are prepared to act with determination they will succeeed in preventing depressions as severe as that of the 1930's. On the other hand, they did not avert the comparatively milder dips and rises of the general business cycle that occurred in 1949–51 and 1936–38 and such changes as these must be expected to recur in the normal operations of total world economy. In the absence of better preparedness even these milder changes will produce violent disruptions in materials markets."

This gets back to the fundamental premise that we will not have depressions in the future as we have adopted a United Nations resolution against depressions but we might have mild dips such as the 1936–38 decline, if one can call that a mild dip.

The Commission shows the variations in the prices of a number of commodities and then states:

"Political stability and steady economic development in the less developed countries obviously are impaired by such extreme irregularities in materials prices, exports, and foreign-exchange receipts. In the Commission's view, United States efforts to assist these countries in improving their situation must include steps to bring these irregularities under better control.

"The factors that cause materials prices to rise and fall more sharply than the level of most business can be isolated. In general terms, it is feasible to determine what devices might brake the upsurges and the plunges. Gaining agreements among the conflicting interests that would have to be reconciled, achieving efficient operation of administrative machinery to check the price swings, timing the moves that would have to be made—these are problems of extreme difficulty."

These difficulties do not deter the Commission. It states:

"In the belief of the Commission, international action can be effective in reducing instability in the materials markets within such milder cyclical swings of general business as occurred in 1936–38 and 1949–51, and this action is imperative if the world is to forestall a return to the evils and disadvantages of cartel rule in the market place. Solutions should be sought in the interest of the greatest good of the greatest number and of a kind which will provide the greatest benefits for the growth of the free-world economy. The Commission is convinced that the right solutions lie in the direction of expansion and growth, not in the direction of quotas, narrow national action, and restrictions on production and trade."

The Commission then reviews the national efforts which have been made to control and stabilize prices. It says:

"The fear of market instability is one reason why United States long-term purchase arrangements are necessary. They are selectively designed to stimulate individual producers to supply certain critical materials in necessary volume. These long-term purchase commitments with minimum price guaranties relieve individual producers of a part or all of the market risk of increasing production. The Commission recommends in chapter 13 that authority be granted to continue these operations after the current emergency ends. But the overriding purpose of these purchases, mainly for the stockpile, is to increase materials security, not to stabilize markets. In fact, stockpile-purchase policies have had destabilizing effects on world markets. It should be possible to reduce disruptive effects of such by better programing of purchases.

"Attempts to stabilize materials prices and trade within separate countries unilaterally would in all likelihood only aggravate instability in world markets. Such has often been the result of the various United States agriculture-support programs which originated in the thirties and employed production controls and Government buying in an effort to stabilize prices of the protected commodities relative to other commodity prices.

"National stabilization devices for industrial raw materials are clearly unsatisfactory for two reasons:

"First, to insulate domestic prices against fluctuations of world prices would lead to a variety of restrictions on trade—export subsidies to enable domestic

producers to sell abroad, import quotas to protect them against lower priced materials from abroad, and sometimes outright embargoes, such as that imposed by the United States on imported butter.

"Second, devices of this nature conflict with the principles of commercial policy which the United States has been advocating to the world. To extend stabilization measures to markets for industrial materials such as metals would compound the difficulties to which our agricultural policy has already given rise, and would make it impossible for the United States to fulfill its commitments under the General Agreement on Tariffs and Trade in which we have taken the leadership. (Covering four-fifths of the world's trade, this agreement has led to 3 conferences which, since 1947, have lowered tariff barricades.)

"The Commission views a strictly national stabilization policy in industrial materials as impracticable and highly undesirable."

Having rejected a strictly national stabilization policy, the Commission then considers international efforts at control. It says:

"The Commission is convinced that the solutions to the problem of materials market instability must be sought through international agreements in which the United States will have to take a leading part."

The Commission then endorses the International Materials Conference in the following statement:

"The United States Government already is cooperating with other nations in efforts to solve various problems of the materials market. There is no doubt that the allocation recommendations of the International Materials Conference, which the United States helped to establish, are having some stabilizing effect on the prices and markets for materials during the present emergency."

It admits that the International Materials Conference is part of the same philosophy embodied in the discredited Havana Charter. It says:

"After the war, extensive and difficult international negotiations on this subject culminated early in 1948 in drawing up chapters V and VI of the Havana Charter for an International Trade Organization. Chapter V relates to cartels and chapter VI to international commodity agreements.

"In essence, the charter laid down the principle of nondiscrimination in international trade and called for reducing tariffs and eliminating tariff preferences. It set forth the general rule that quantitative restrictions or quotas should not be used to regulate the import or export of any product, save under exceptional circumstances. The chapter on cartels recognizes the futility of removing discriminations and reducing trade barriers imposed by governments if business enterprises are free to create them. It requires prevention of restrictive or discriminatory practices by private firms.

"Chapter VI on international commodity agreements may be viewed basically as a qualification of the charter's provision against export and import quotas. It recognizes that exaggerated materials price declines may cause severe distress to producers, and permits multilateral agreements regulating the prices, production, or the volume of imports and exports of such commodities. It gives this permission only when burdensome surpluses are expected which threaten severe unemployment or hardship to numerous small producers (in article 62). Such agreements, although renewable, are to be limited to 5 years or less and are to be accompanied by a program of economic adjustment designed to remedy the underlying difficulties. Full publicity is provided for all such agreements and an equal voice in their operation is to be given producing countries and principal consuming countries."

Although the Commission admits international agreements present problems, it sets down the following goal for the United States:

"Difficult though international agreements are to achieve on materials problems, the path to stability of markets clearly lies in this direction. Two principles, in the Commission's view, are of prime importance from the standpoint of promoting economic growth:

"First, arrangements should be sought which minimize restrictions on materials production.

"Second, commodity agreements should interfere as little as possible with normal market processes.

"These general principles cannot, of course, be translated into a blueprint for action; moreover, the problems of each commodity must be approached on a case-by-case basis. Nevertheless, the Commission believes special consideration should be given to three types of arrangements which can go far toward meeting the above criteria: (*a*) The multilateral contract; (*b*) international buffer

stocks; and (*c*) international buffer stocks combined with limited quota arrangements."

Pages 87–89 review the mechanism of the multilateral contract, international buffer stocks and international buffer stocks combined with limited quota arrangements. No effort will be made to review this material in detail as these pages should be read in their entirety to fully understand the Commission's position. It is significant, however, that the Commission uses the Wheat Agreement as the model for other multilateral contracts. The Commission says:

"Many problems that can be expected to arise under multilateral contracts have already been faced under the Wheat Agreement. The fact that the latter has worked is the best evidence that those problems can be solved. One major reservation must be made concerning experience with the Wheat Agreement. Since the world price has been above the maximum agreement price for the entire life of the agreement, the exporting countries have borne the full costs of stabilization. Since the major exporters (the United States and Canada) enjoy a strong balance-of-payments position, these sales below world market prices have not given rise to serious problems for Canada and the United States. The real test would come if importing countries, many of whom are in weak international financial positions, were faced with the obligation to purchase at agreement prices above the world price."

The report does not mention the fact that the International Wheat Agreement has been a very expensive agreement for the United States taxpayers. Actually, the International Wheat Agreement replaced the British-Canadian Wheat Agreement which had already cost Canadian farmers some $600 million. The present Wheat Agreement was fostered by the British Labor Government. It is estimated that it has cost Canadian farmers $200 million since it was signed, and has cost the United States taxpayers $600 million. The cost to the United States taxpayer arises from the fact that we are compelled to sell a minimum amount of wheat at a maximum price considerably below the United States support price. It is difficult to see how an agreement of this character can be continued and if other commodities are to involve the same losses, then the American taxpayer is really in for a serious long-term problem. The Randall Commission has condemned the extensive use of commodity agreements as advocated by the Paley Commission.

Buffer stocks, which are also looked upon with favor, would require working capital for their operation. The Commission says that it would be reasonable for all participating countries to contribute to the requisite financing. Each country's contribution might be determined by its relative share in the world's exports and imports. This again can only mean that the United States will supply most of the working capital, and will assume most of the losses which will undoubtedly occur.

The Commission recognizes that the United States military stockpile operations might interfere with the international buffer stocks. It says:

"Military stockpile operations might conceivably jeopardize proper functioning of international buffer stocks, because large-scale sudden purchases might prevent buffer stocks from limiting extreme price rises, from acquiring stocks of their own, or might cause a premature and risky depletion of buffer inventories. Sales from military stockpiles might be on a scale sufficiently large to overtake the stabilizing capacity of buffer stocks.

"Elsewhere the Commission has expressed its view that, consistent with the overriding security purpose of military stockpiles, better programing would reduce the disruptive effects of stockpile purchases. Buffer stock authorities could then take stockpile demand into account as one element in the basic market picture for the commodity. For certain commodities the stockpile might take up slack in demand, postponing the need for buffer stock action to absorb surpluses and steady threatened price declines.

"As for the danger of sudden stockpile liquidation, this would be minimized under the policy (recommended in ch. 29) that withdrawals be authorized only when clearly required for reasons of national security. There is a strong presumption that, at such times, the market would be tight and stockpile releases would supplement the price moderating activities of the buffer stock."

This philosophy is completely contrary to our present stockpile law which was designed with only one purpose in view—to acquire the necessary strategic materials as rapidly as possible and then to withdraw from the market.

The Commission's conclusions are given below:

"The Commission believes that, on balance, the international arrangements that hold the greatest promise for stabilizing materials markets and, at the same time, for promoting the increased production of materials that the future will demand are the multilateral contract type of agreement and buffer stock agreements either without or with quota provisions on exports or production. The appropriate mechanism for particular problems must be decided case by case.

"The Commission believes further that, despite the clear difficulties of negotiation and the fact that the United States would be called upon to finance a considerable share of the costs, commodity agreement of the type endorsed hold sufficient promise of reducing materials market instability and its harmful consequences to free nations to merit serious consideration and efforts to work out, as test, stabilization agreements with other countries for a few materials. Greater stability would mean enlarged production of scarce materials. Failure to work toward stability would continue a major source of economic strain in the free world, and would leave the door open for reappearance of the prewar cartels and restrictive agreements with consequent limitations on production, consumption, and trade."

The only comment which can be made is that this chapter recommends complete departure from the free market. If these proposals were adopted, it would result in a United Nation's bureaucracy establishing prices, allocations, and quotas for all of the world's materials. The Commission admits that chapter V of the original Habana Charter was designed to outlaw private cartels, but it was only accepted after chapter VI was offered which as the Commission admits: "* * * may be viewed basically as a qualification of the charter provisions against export and import quotas." In other words, a governmental cartel is to replace private cartels.

The Congress of the United States refused to accept the Habana Charter after its submission by the President of the United States. In December 1950 it was announced that the charter had been withdrawn, and no further action would be taken to secure its acceptance—yet this report by a Presidential Commission includes the following:

"By resolution of the United Nations Economic and Social Council, a review of chapter VI of the Habana Charter is called for sometime in 1952. This code serves as a general guide for efforts of the free nations to stabilize materials markets.

"The chapter as it now stands certainly does not provide the ideal framework for the proposals and actions which this Commission has suggested for promoting market stability. In article 62, it attempts to lay down generally applicable economic standards as a basis for testing the desirability and legitimacy of future agreements on specific materials. Though open to varying interpretations, the chapter is predominantly oriented to the problem of maetrials surpluses rather than to meeting the expected long-run increase in demand.

"The Commission has viewed the question of revising chapter VI primarily from the standpoint of whether or not the suggested types of agreements could be negotiated under its code. The practical choices facing the United States, in the Commission's opinion, are either (*a*) to advocate retaining chapter VI substantially in its present form, or (*b*) to advocate replacing it by a simple and more flexible set of procedures, for considering and establishing international commodity agreements.

"Trying to reformulate, in the light of present long-run commodity projections, the highly subjective and admittedly inadequate standards of article 62 would invite a repetition of the difficulties which the present version presents.

"Whether the United States supports retention of chapter VI in its present form or its replacement should depend, in the Commission's judgment, on a determination as to which course would make possible the more rapid and constructive international action toward stabilizing materials markets."

The Commission has suggested the use of international buffer stocks combined with limited quota arrangements, a variation of the ever-normal granary. Plans embodying these concepts have appeared throughout recorded history but have never succeeded. There is no reason to believe that any future plan will prove successful. These plans are nearly always defeated by the inability of the controlling agency to outguess the market. The tendency is to set prices too high, so that unwieldy stocks are ultimately accumulated, and which have to be disposed of at heavy losses. No international group has sufficient wisdom to out-

guess the thousands of factors that influence international commodity markets, ranging from the weather to the availability of foreign exchange.

Free markets have a vital function to perform, unpleasant as the behavior of such markets may seem at times. They are a priceless and automatic governor of production and consumption. It is folly to disturb them.

The suggestion that quotas be established is perhaps one of the most dangerous in the entire report. Any international group with the power to determine quotas of consumption and production has the power to determine our standard of living. This power should not be placed in the hands of any international agency.

There can be little doubt that the only purpose in including chapter XV in this report was to justify United States participation in the International Materials Conference and to set the stage for a resubmittal of the Habana Charter.

Herbert Hoover, while Secretary of Commerce, delivered an address before the chamber of commerce at Erie, Pa., in 1925, entitled "Foreign Combinations Now Fixing Prices of Raw Materials Imported Into the United States." His remarks are applicable to the present situation and follow immediately.

[An address by Herbert Hoover, Secretary of Commerce, delivered before the Chamber of Commerce, Erie, Pa., October 31, 1925]

FOREIGN COMBINATIONS NOW FIXING PRICES OF RAW MATERIALS IMPORTED INTO THE UNITED STATES

I wish upon this occasion to discuss a matter of considerable gravity in our foreign trade.

Foreign controls of production and price have been created in a number of important raw materials which, because of our inability to produce we must depend upon purchasing abroad. The combinations to which I refer have been set up either directly by legislation of foreign governments or indirectly by government patronage. This sort of control of production and price exists today in coffee, silk, nitrates, potash, rubber, quinine, iodine, tin, sisal, some dyestuffs, quicksilver, certain tanning extracts, and some other things. To demonstrate that this is not an inconsequential matter requires only the recitation of the fact that we expend annually about $800 million for imports now subject to such controls. They amount practically to trade war, and the time has arrived when we require either disarmament or defense.

Three years ago I pointed out this incipient growth and the many dangers which lay in such activities, both to the consumer and producer and above all from the larger view of world interest and progress. At that time my statement was discounted by some for we were assured by their sponsors that the purpose of these controls was merely to temporarily stabilize industry and trade over the disturbed postwar period, and that the consumer would actually benefit as well as the producer.

But these combinations have continued to increase in numbers and some of them have demonstrated all the dangers which I then anticipated and more. The time has arrived when a full, frank discussion of the whole subject is desirable. For true and effective judgment as to the course of action that should be taken by nations can only be formed by a hammering of the facts upon the anvil of debate.

At the outset I wish to emphasize that in this discussion I am not criticizing any foreign government or its nationals. I have perhaps had a unique post of observation and I therefore have infinite sympathy for the economic difficulties of all governments during these years. But the world is rapidly gaining stability and measures which may have been necessary to statesmen distraught with the problems of readjustment can now be reconsidered.

Moreover, it could also be said that the buyer of a commodity has an inalienable right to argue at the price even when his friends are the sellers. He has a right to consider all these things from his own point of view without any implication of unfriendliness or criticism for there are 2 parties in these matters—buyers and sellers, not 1 party. But far above this, if a man sees his friends pursuing courses which can only lead to mutual disaster to themselves or the community in which we all live he is a poor friend who does not say so and say it frankly. And it is equally true among nations.

The economic distortion during the war made controls necessary on a hundred commodities in order to prevent hoarding and profiteering and to stimulate production by guaranteed prices. These controls were intended solely to stimulate

production, not to restrict it, and were dissolved at the end of the war, while those now current are, with a few exceptions, the creation of the last few years and for the purpose of increasing price levels through limiting production. They plainly revolve around the monopoly possible over certain raw materials which temporarily or permanently are dominantly produced within the confines of a single nation, and upon which the 50 other nations of the world are dependent for their standards of living and comfort. In no case does any one country possess the total supply of any one of these commodities, but in many cases they possess sufficient that when mobilized they can control the price.

Various legal forms of these price controls have been devised, but in all cases they depend upon governmental action of some kind and their method is either to restrict exports or to establish a unity in selling against the competition of the buyers. I believe in all cases these controls make the same prices to their own citizens as they do to foreigners, but likewise in all these cases their home consumption is but a small percentage of their total production.

These international monopolies have a very wide difference from governmentally created domestic monopolies. In all modern governments where we do create a monopoly we likewise regulate its prices and profits in order to protect the consumer. In these international monopolies the consumer has no voice at all.

We, as a government, have set up no such controls and, through the Sherman Act, we prevent our citizens from doing it. The so-called Webb-Pomerene Act is not for this purpose. We have clung tenaciously to the belief that economic progress must depend upon the driving force of competition. The only thing of the nature that has ever been seriously proposed in our country was certain measures of agricultural relief which in themselves did not partake of this character, for they contained the benevolent aspect of proposing to fix a higher price to our home consumers than to foreigners and to thus bless the foreigners with cheaper food.

The problem that faces the world, and possibly the more serious problem, is not alone the commodities that are now controlled but the spread of these ideas. There are many other raw materials whose sources are so situated that they could also be controlled by action of a single government. The price of wool could be controlled by governmental action within the British Empire. The prices of oil, cotton, and copper could be controlled for many years by similar governmental action in the United States. Tea and jute could be controlled by India; antimony and tungsten by China; nickel and asbestos by Canada.

But an even greater danger lies in the fact that if we conceive a spread of these ideas largely into international commerce then it is perfectly practicable under Government patronage for controls to be estabilised by cooperation of producers in several countries and thus steel, vegetable oils, and a long list of other commodities can be brought quickly into this menacing vision.

Moreover, if these combinations now extant prove successful over even limited periods of years the tendencies of all producers when in difficulty will be to press their governments to try these devices for even temporary relief. No government cans it still and deny to its own citizens these privileges of profiteering from the foreigner while they suffer from such action of others.

Unless a halt is called we are likely to see these ideas become established as a regular phenomenon in international commerce.

Any inspection of the list of the present controlled commodities will indicate that few of them actually originate in the great industrial nations, that is, the United States, Great Britain, Germany, France, Italy, Belgium, Czechoslovakia, Austria, Holland, etc. It is true that some of them have been organized in their colonies and some of them participated in by their citizens.

We are, of course, a large producing as well as consuming nation in raw materials, and we have it within our powers to retaliate, so that we could take care of ourselves if the world is to develop this form of international relation. The industrial countries of Europe, however, have little of such resources and the growth of these methods can only lead to further retardation of their recovery. And if we, the strongest of all nations, enter upon such programs of creating combinations we will have given strength to forces of evil in the commercial world which generations could not remedy.

An easy-going and tolerant world, anxious above all things to keep down international friction might let these controls in international trade continue—objectionable as they are—if their conduct in every case had been merely to secure a reasonable profit to the producer. But some of them have advanced prices far

beyond this point and again demonstrate that inherent quality of all combinations in restraint of trade—that no unregulated monopoly is ever content with the reasonable but always seeks to justify the unreasonable on some grounds or other.

Under a special direction from Congress the Department of Commerce has made an exhaustive investigation of these combinations, and I may cite 2 or 3 as showing this particular tendency. The uniform expression of the managers of the rubber control in the East Indies up to 8 months ago was that the industry sought only from 30 to 35 cents per pound for their product, and our investigation showed they could earn about 25 percent on the capital invested when rubber brings that price. It is today over $1 per pound and production is still being restricted. It is said that previous losses of the growers must be recouped. The same might be said by our wheat, cotton, oil, and copper producers. Likewas the assertion of the coffee industry over years since the war was that stabilization was sought only at roughly 12 cents per pound. It has recently been lifted as high as 32 cents and is today 22 cents, with a great surplus of supplies in its possession.

That this difference between "reasonable" and "high" prices is not trivial in its monetary implication to our consumers, is perhaps indicated by the fact that this margin alone over the whole list is today costing up upward of $300 million per annum. And it is not our people who are alone concerned but every other consuming nation in the world.

THE ECONOMIC RESULTS OF SUCH CONTROLS

From an economic point of view, we have two parties to consider in all interchange—the consumer and the producer. High prices stifle consumption and when we stifle consumption we do two things: reduce the standards of living of the consumer and in the long run tend to reduce the business of the producer. The consumer at once seeks every device to get larger use out of a smaller quantity, and he turns, consciously or unconsciously, to the use of substitutes. The demand for substitutes stimulates every genius to discover and exploit them. I am not talking of adulteration. For instance, the coffee drinker abstracts the last drop from his beans and turns to tea and cocoa. We thus reduced our consumption of coffee by 20 percent during the past year. The rubber user patches his automobile tires and recovers old rubber to use it again. Every chemical laboratory starts on a search for better methods of rubber reclamation. The tin user turns to galvanized iron and glass containers. The farmer demands of his government that it shall produce synthetic nitrates. On the production side the whole world goes searching for other sources of supply outside the controlling country. High profits stimulate production wherever possible in other quarters.

If all these forces be carried to the extreme, the combined result may ultimately bring some of these controls in a crash around the entire industry—producers, manufacturing consumers, and distributors alike.

There is here a danger often overlooked, for the distributor and manufacturing consumer of these commodities is compelled to carry large stocks of raw materials in transit, in factory reserve and in process of manufacture. The manufacturers commitments to his trade for forward orders compel him to bear a large loss during the rise in prices and if prices break he must offer his goods based upon price of raw materials of the day. Thus the ablest managed manufacturing or distributing business is in constant jeopardy from forces they cannot themselves control.

The very erection of these controls is an invitation to the entire consuming world to fight militantly for its existence. The length of time that any particular control can last against these forces no doubt depends upon the degree of need for any particular commodity and the other possible sources, and the possibility of substitutes. These forces can probably break the control of any agricultural product in a few years, for many alternative sources of production exist. Advance in synthetic production of some chemicals will perhaps remedy these combinations. Others might be more difficult to meet. However, these pressures operate very slowly and in the meantime I assume that these facts being well known to the controlling nations they calculate on reaping such a harvest as will compensate them for the ultimate possible demoralization of their producing industry.

INTERNATIONAL RELATIONS INVOLVED

From a political point of view (and I am not speaking of domestic politics but of international relations) these actions and their reactions are alive with danger. As long as our international commerce is based upon the higgling of producers and merchants in a market whose floor is the free flow of supply and demand, their sorrows, and exultations do not affect national emotion. It may be that if these controls had never existed prices might temporarily go as high or higher, but in such an event there would be the quick response of increased production with its relief to price, and in any event there would be no national feeling over such natural courses of trade. Instead of this we see today continued restriction and above all the arousal of national feeling of injury.

The moment that a government directly or indirectly fosters or establishes these combinations then that government has taken the responsibility for the prices. Whether these prices be reasonable or high, the populations of the consuming countries direct their attention upon the selling government and the matter becomes one of national emotion among all consumers. These peoples at once appeal to their government for action that it should use its great powers for their protection. Every day for the past year our Government departments have had to deal with exactly this thing. And at once we have higgling of merchants, lifted to the plane of international relations, with all of its spawn of criticism and hate.

Our foreign offices will thus sooner or later become the bargainers in the market and the negotiations of each of them are backed by a fine lot of rooters for the home team. In the long run it will not even have that softening good will of sportsmanship for the fixing of prices cannot be based on altruism. The world will never go to war over the price of anything. But these actions can set up great malignant currents of international ill will.

WHAT IS THE REMEDY

Question naturally arises as to what we, a Nation great both as a consumer and a producer who have so far resolutely refused either to set up such combinations in our products or to allow our citizens to create them, should do in these circumstances. We cannot allow this situation to go unheeded. There are several alternative courses of action.

We could resolutely set ourselves to reduce consumption in every article that is so controlled. We could stimulate the use and manufacture of substitutes. We could induce our citizens to go abroad to other regions and establish rival production. We could prohibit the extension of credit to countries where such controls are maintained. We could request the rest of the consuming world to join with us in these campaigns. It might be that such activities would bring about an everlasting lesson to the whole world. But this is trade war and we want to live in trade peace.

Alternatively we could say to ourselves that we will revise the whole of our traditional national policy of competition as the base of production and that we will legislate and encourage the establishment of these combinations for our own producers with the view of getting back compensating amounts from helpless consumer nations. Our resources are so varied and our people so ingenious that we could probably reap a rich harvest in the final balance in holding up the rest of the world.

Alternatively again, we might say to ourselves that these combinations are inevitable, and they will be continuing phenomena; that therefore we, being a great consumer, will set up defenses by authorizing our merchants and manufacturers to buy these commodities through a single agent and thus meet the issue of a single seller with a single buyer. For the organized consumer has ever proven stronger than the producer and we could win out in such a battle. No doubt such a course implies that we must set up distasteful regulation that would provide for protection of our consumer as against this single middleman.

Another alternative which has been suggested is that the consumer nations of the world should secure by international agreements the same rights which they would secure in a domestic monopoly; that prices should be regulated under circumstances that the consumer has an equal voice with the producer.

But I have no liking for any actions of this sort, for they are either destructive of the one hope of the world—progressive production—or they are a recognition of the permanent establishment of these policies in the future international commerce. They contemplate international trade in an atmosphere of contention

and dispute instead of peaceful cooperation. The problem should be met on the ground of what in the long run will produce good will and prosperity to the entire world, for no single nation can disassociate its prosperity from the prosperity and good will of all of them.

The world is emerging from the chaos of the war, and these governmental measures are no longer justifiable, since the producers of the world may look forward to more stable times. We are also at the point where the whole consuming world is being driven toward destructive courses to protect itself from exploitation by these controls. Therefore the time has come when a solution of this problem is both urgent and more feasible.

I am convinced that the sound solution does not lie in any of the alternatives I have outlined; they are all in the nature of last resorts. They recognize trade war. I believe the solution does lie in the willingness of statesmen throughout the world to recognize the consequences of Government controlled production and price, and to meet the issue in the only way it should be met, that is, by abandonment of all such governmental action.

CHAPTER XVI. SUPPLYING ENERGY FOR ECONOMIC GROWTH

Chapter XVI presents a general discussion of the energy demands of our economy. The Commission states that our progress can be measured in terms of our use of energy from mineral fuels and waterpower. It says:

"The drama of the industrial revolution and a century of remarkable progress in United States living standards can be written in terms of constantly improved technology and ever-increasing use of energy from mineral fuels and waterpower in our factories, farms, and homes. With a labor force today little more than twice as big as in 1900, accompanied by more capital, better techniques, but with a four-and-one-half-fold expansion in energy use, the United States economy in 1950 turned out almost 5 times the 1900 total volume of goods and services.

"In more familiar terms the same story is told all around us every day. The farmer operating a 3-plow tractor today can plow 10 or 12 acres in the time it took a 6-horse team to plow 4 to 5 acres a few decades ago. To mine a ton of iron ore the average miner took 114 minutes in 1915, but only 26 minutes in 1950. The electric washing machine and drier save the housewife four-fifths of her former laundry time."

The problem before the Nation is set forth by the Commission as follows:

"To assist the economy to expand normally and to assure the national security, the United States by 1975 must have a supply of fuels and electricity roughly twice as large as it used in 1950. The requirements of other free nations can be expected to increase on about the same scale.

"Four questions briefly point up the energy problems which policy must attempt to solve:

"Does the United States have the natural sources—the petroleum and gas, the coal and waterpower—to provide enough energy for the future?

"Will the real costs of energy be forced upward, and will any resultant rise retard economic growth?

"In the event of all-out war at any time in the next 25 years, will the United States and its allies have enough fuels and other forms of energy to support full economic mobilization and maximum fighting strength?

"What opportunities are there for strengthening the long-term energy position of the United States and other free nations and what will it take to develop these opportunities?"

The Commission makes a distinction between primary and secondary fuels. Primary fuels, as defined by the Commission, are coal, crude petroleum, and natural gas. Our economy is characterized by the use of secondary fuels, which are defined as gasoline, fuel oil, electricity, coke, etc. The Commission states:

"It will take more primary fuel at the production level to yield an equivalent amount of secondary energy to the consumer. The production of secondary forms is itself a manufacturing process and requires a heavy consumption of energy both for transportation and in the conversion process. Losses occur because, for example, in steam generation of electricity some of the energy content of the coal, oil, or gas, burned goes up the flue or is dissipated in the mechanical and other inefficiencies of the process. Thus the trend toward relatively greater use of secondary energy forms will place an extra drain upon the Nation's basic fuel resources."

This statement is very misleading. Certainly less energy is wasted when fuel oil is burned in a diesel locomotive than when coal is burned in a steam locomotive. If this were not the case, the conversion from steam to diesel fuel would not have taken place. When homeowners convert from an anthracite coal-fired heating plant to an oil burner, they are not necessarily using more of the Nation's fuel reserves as implied by the Commission. The new burner may be much more efficient and the energy losses in producing fuel oil from the petroleum may be much less than those involved in hauling coal from the mine to the owner's home. Certainly the Commission cannot be suggesting that we should use the heat energy in fuel directly rather than convert it into electrical energy. The Commission's confusion is shown in its statement on page 107:

"It has been estimated that the amount of oil spent each year in order to add a few extra octane points to gasoline in the refining process is equal to the annual output of the east Texas oil field, our largest pool."

Yes, it takes energy to produce high-octane gasoline from petroleum, but the high-octane gasoline when burned in a modern engine produces so much more transportation than the gasoline produced 25 years ago that less petroleum overall is required. It makes little difference to the national economy whether there is a loss of energy in the refining profess or whether it takes place in the cylinder of the automobile engine. The national economy is only concerned with minimizing the total amount of this loss. Fuels such as tripane could be produced with much higher octane numbers than any now available. The manufacture of triptane would consume so much energy that on net balance no real gain would take place under existing processing techniques.

Oil companies and automobile manufacturers are constantly searching for the best overall balance. Each oil company and each automobile manufacturer will have a different opinion as to where the best balance lies. In a competitive economy, the forces of the market will make the necessary adjustments. The Commission recognizes that this is so on page 105 when it says:

"The tremendous rise in demand for gasoline evoked a similar increase in supply at lower real costs."

The petroleum industry is one of the few industries that can sell a substantially better product than it produced 25 years ago at the same price, before taxes. The petroleum industry has offset the entire depreciation in the value of the dollar through its technological advances during the past 25 years. Two gallons of today's gasoline in a modern engine will do what 3 gallons of the 1925 gasoline could do in the best engines of that period. This is real progress and the Nation has gained immeasurably through the conservation of our resources from this progress in both the petroleum and automotive industries.

The Commission states that:

"Further shifts in the energy mix can be expected as the Nation's consumers constantly adjust to the lowest cost combination of energy supplies.

"Meantime, the Nation's energy position can be strengthened by: (*a*) Enlarging effective domestic fuel resources, (b) getting greater use from these resources, and (*c*) getting more fuels from abroad.

The experience of the past 50 years shows that the steps which the Commission urges will take place through market forces and free competition if uninhibited by Government planning and controls.

CHAPTER XVII. OIL—HOW MUCH? HOW LONG?

This chapter reviews the long-range outlook for petroleum. The Commission states:

"Petroleum is the great enigma of future energy supplies. Many have guessed but no one can know how much more petroleum will be discovered in the United States during the next two decades, or how much it will be feasible—geologically and economically—to produce by 1975.

"For years some people have been predicting that the Nation's crude oil supply was going to be exhausted within 10 to 20 years. Yet discoveries and output have continued to rise. In 1951, 2 barrels of oil were found for every one extracted, and 2 cubic feet of gas found for every one extracted. Between 1925 and 1950 domestic oil production rose from about three-quarters of a billion barrels to nearly 2 billion, and rose another quarter billion barrels in 1951. Proved recoverable reserves in 1951 were estimated at 27.5 billion barrels (excluding 4.7 billion barrels of natural gas liquids) against only 8.5 billion in 1925.

"But no matter how large the Nation's petroleum resources ultimately prove to be, one fact is now clear: eventually the resources will dwindle and become progressively inadequate. One warning signal has already appeared; within the last 5 years United States demand for crude petroleum has begun to outstrip domestic production, and, for the first time, the United States has become an important net importer.

"In spite of uncertainties over future sources of supply, these facts and prospects seem clear:

"First, discoveries of petroleum in this country will not stop abruptly, nor will reserves become exhausted suddenly and without notice.

"Second, domestic crude production can be counted on for a long time to supply a sizable portion of liquid fuel demand, even though it is debatable whether the 1975 level of production will be lower or higher than now.

"Third, regardless of the level of domestic production in 1975, imports of crude oil and refined products by 1975 probably will be greater than now.

"Fourth, synthetic oil, probably first from shale and later from coal, will come into commercial production within a decade or so, perhaps sooner."

The Commission believes that this country should encourage oil importation to protect our own reserves and to further the development of proved reserves in other areas. It states:

"The Commission believes that present knowledge of this Nation's future oil position does not warrant discrimination against imports of crude oil from any quarter of the world. Every encouragement should be given, within limits of economic reasonableness, to establishing greater oil reserves and production capacity in relatively safe areas, particularly in the Western Hemisphere, but not by placing penalties on oil production elsewhere. In view of its future needs and limited resources, this Nation should welcome crude oil imports, not place obstacles in their way. Tariffs on crude oil imports should therefore be held down, reduced, or eliminated within the limits imposed by national security considerations."

The Commission should be commended for the following statement:

"The tasks of policy in meeting expanding peacetime demands for liquid fuels do not appear formidable. It seems clear that imports and domestic synthetic oil over the years could take up any slack in United States liquid fuel supplies and impose a competitive ceiling on oil costs not very much above present levels.

"Private business can be counted on to bring about the bulk of necessary adjustments at an appropriate pace if no uneconomic impediments to domestic crude oil exploration and production are allowed to develop, if imports are permitted to flow freely in whatever amount the price situation dictates, and if synthetic production is not discouraged by shortages of capital, monopolistic restraints, or the like."

Security is the problem of paramount importance in connection with petroleum. The Commission clearly states that "The first prerequisite is, of course, to

maintain a thriving oil industry in the Western Hemisphere." The Commission then develops the possibility of an underground stockpile. It says:

"Severe rationing of nonmilitary use would fall far short of closing the gap even with much stricter reductions than in the last war. There can be no conventional stockpile of oil to fall back on. Therefore, the equivalent of a stockpile—an emergency cushion of oil production, refining, and transportation capacity in the Western Hemisphere which can quickly increase supply—is imperative in meeting the problem.

"What obviously would help most in time of war would be to have an 'underground stockpile' of semiproved oil deposits which could be drilled up as required with maximum speed and at minimum expenditure of materials and manpower on 'dry holes.' A large area which lends itself to such treatment is presently the property of the United States Government, the Continental Shelf, particularly that section off the gulf coast. Geologists are agreed that prospects for finding large pools of oil in this offshore area are excellent. But there still remain the difficult and expensive technical problems of exploring and producing 'underwater oil.'

"The private oil industry can solve these technical problems if given access of the Continental Shelf. Government leases permitting private oil exploration and development can provide such access and incentive. The Nation can help to establish a security reserve of crude oil if leases are so written as to require wide spacing of wells or limited withdrawals or both, and by setting royalty provisions which allow for adequate financial incentive. By allowing fewer producing wells than would be worked in normal practice, or keeping withdrawals below the usual rate, or a combination of both measures, the life of offshore pools might be considerably prolonged.

"In addition to a crude-oil reserve capable of supporting a higher level of production in an emergency, there must also be corresponding standby refining and transportation capacity. The industry itself, once the steel production shortage eases, has incentive to enlarge capacity enough to carry a moderate 'reserve capacity.'

"Carrying out these recommendations will provide a 'stockpile' of extra production capacity for an essential of war which cannot be stockpiled in the conventional way. It will cost money—a great deal perhaps—but the price of this insurance would be cheap if war should come."

The Commission therefore recommends:

"That the Federal Government encourage immediate exploration for oil on publicly owned offshore lands; that leases to private companies, whether by the Federal Government or the States, contain provisions requiring well spacing or withdrawal rates calculated to increase the normal life of the pool with a view to providing faster withdrawals if ever such action is required to meet the needs of war.

"That, in administering Federal oil lands generally, the Department of the Interior, wherever feasible, require conservation well spacing and withdrawal rates designed to prolong the life of pools and thus ensure a larger, readily available crude oil reserve whose production can be quickly expanded for emergency use.

"That conservation agencies of oil-producing States likewise give heavy weight to this security objective in their regulation of well spacing and production rates."

In considering these recommendations, it must be realized that well spacing should be dictated so as to assure the maximum ultimate recovery.

The Commission suggests that synthetic oil may provide a security cushion for the future. This is a more controversial subject. The Commission recommends specifically:

"1. That the Federal Government give limited financial assistance to any qualified private companies that will undertake the production of oil and shale in order to encourage as soon as possible the construction of small-scale commercial plants and thus accelerate the gaining of technical knowledge necessary for later economical expansion. For the present, one promising form of such assistance is for the Government to absorb a sufficient portion of the transportation costs from plant to market to give synthetic producers a competitive position with crude petroleum products in those markets.

"2. That the National Security Resources Board, with the aid of the Department of the Interior, undertake a continuing study of the economic aspects of producing synthetic liquid fuels from shale and coal in relation to security needs and the outlook for future petroleum supplies."

These recommendations again involve subsidizing private companies with direct Government aid. In view of the success of the petroleum industry in finding new petroleum reserves, it is questionable whether such assistance should be granted at this time for there is no reason to believe that the oil industry, itself, will not undertake the development of oil from shale when the price-cost relationships justify this development.

An article in the Journal of Commerce of August 13, 1952, is significant in this connection:

"The chairman of the board of Standard Oil Co. (Indiana) today scored Interior Secretary Chapman's recent proposal for construction of commercial plants to make liquid fuels from coal or shale, characterizing the plan as 'most premature.'

"Dr. Wilson noted that the oil industry is finding oil faster than it is using it. He cited the report of the President's Materials Policy Commission which indicated that methods of finding and producing oil are constrantly being improved. Secondary recovery methods are constantly being improved, he added.

" 'Moreover, in addition to the 32 billion barrels generally counted as our proved reserves, we know the location of more than 100 billion barrels.'

"As still another cushion against future shortage, Dr. Wilson pointed out, large amounts of residual fuel oil could be hydrogenated to make gasoline and other more valuable products.

" 'Since it will be much more than a decade before synthetic fuels from any of these routes can really compete with petroleum, the interim should obviously be spent on pilot-plant and other small-scale development work, aimed at improvement of the processes for converting both coal and shale. Large-scale plans would probably be obsolete before they were completed, and would cost many times as much as an intelligently planned research program which would give information of more real value.' "

Frank M. Porter, president of the American Petroleum Institute, in an address before the Interstate Oil Compact Commission at Phoenix, Ariz., on May 10, 1952, said:

"Demand and supply of oil are affected by the economic factors involved. The incentive which stems from possible profits is one of the most powerful factors to the supplier. Price is equally as powerful an element in determining the use which the consumer makes of the oil and its products. All economic considerations must be regarded in answering the question of availability. Today we are extracting twice as much gasoline from a barrel of crude as we did in 1917. Quality of gasoline has improved 50 percent in 25 years. This represents a tremendous gain in availability. The consumer decides how these gains are to be used; whether for additional mileage, or for more powerful automobiles, more automatic features, and more efficient performance.

"We have grown accustomed in the petroleum industry to having the consumer make the basic decisions. This is the heart of the competitive system. For instance, during recent weeks we have seen some conflicting statements on the possibility of producing gasoline from coal at a price competitive with gasoline from crude oil. Some of the advocates of gasoline from coal claim that this can be done for slightly under 12 cents a gallon before profit and taxes. I say: Why debate it? If the financial backers of such a process feel that it can be done, why not enter their product in this highly competive market and let the market answer the question? Apparently, however, many of these schemes envision a Government subsidy or markets and prices guaranteed by the United States Treasury. We do not regard that as the competitive test. Nor is that a sound approach to availability of liquid fuels in abundance."

Many of the statements of the President's Materials Policy Commission regarding the present petroleum situation were advanced 30 years ago. Three articles by David White, Chief Geologist of the United States Geological Survey in the early 1920's, are included in this section.

1. A paper, The Petroleum Resources of the World, presented before the American Academy of Political and Social Science, which appeared in The Annals, May 1920.

2. An article, Our Future Oil Supply, which appeared in the Engineering and Mining Journal of June 4, 1921.

3. An article, The Oil Supply of the World, which appeared in Mechanical Engineering of September 1922.

Dr. White's forecasts have, of course, been completely disproved and appear ridiculous to us.

It is significant that he was suggesting immediate development of our shale deposits regardless of cost. He, too, was concerned with the fact that oil imports at that time were assuming greater importance.

A comparison of the President's Materials Policy Commission's chapter on petroleum and Dr. White's articles, show that the Paley Commission has made no new contribution in this area.

[The Annals of the American Academy, May 1920]

THE PETROLEUM RESOURCES OF THE WORLD[1]

(By David White, U. S. Geological Survey)

INTRODUCTION

Petroleum in the United States is a wasting asset so far depleted as no longer to afford a secure foundation for the obligations based upon its assumed continued adequacy. Barring unexpected good fortune in the search for new supplies, or even less unexpected curtailment of consumption, the petroleum production of the United States is likely not only never again wholly to meet our requirements but even to start soon on the long decline of a waning output.

For the first time in her history the United States is witnessing the day when one of her greatest stores of mineral wealth—her most dazzling and spectacular endowment, on which her prosperity, industries, and standards of living are so largely dependent, and which imparts a characteristic and essential quality to her civilization—is approaching exhaustion and so is no longer able to meet her growing necessities. After 60 years of prodigal generosity and profligate waste she discovers that here oil heritage is far spent and that henceforth she must become more and more dependent on the stores of other countries. The purpose of this article is to review our domestic supplies and to consider their life and the extent to which they may supply our prospective needs; to present a rough attempt at an appraisal of the oil resources of other regions of the world based on our present most insufficient and fragmentary knowledge, and to call attention to the necessity for assuring the protection of this country by securing, even under increasingly unfavorable competitive conditions, sufficient oil reserves abroad to provide for our needs as long as oil is available to meet the requirements of other nations.

OILFIELDS OF THE UNITED STATES

Oil remaining available in the ground

The quantity of oil remaining available in the ground in the United States in January 1919 was conservatively estimated by the oil and gas geologists of the United States Geological Survey at 6,740 million barrels.[2] By "available" is meant recoverable by present methods of production. About one-half of these reserves are heavy oils.

A word should be offered as to the basis of this estimate, its mode of preparation, and its probable range or error. It is based on the results of the personal examinations of many of the producing and possible oil regions of the United States by the different geologists; on reviews of the production histories of the discovered or developed fields in this and other countries; on the geological conditions of occurrence of oilfields in all parts of the world and comparison of these oilfields with geologically similar but untested regions in United States; on the study of the structure, composition, alteration, sequence, and relations of the geologic formations, and on the critical review of surface indications, well records, sections, well production curves, sand characters, water relations, etc. It represents, for the most part, the weighted best, but deliberately conservative judgments of these geologists in conferential consideration of all the data then available. It does not differ greatly from the results of two previous estimates made by geologists of the Survey, and it is probably the best founded and most reliable estimate yet formulated. Nevertheless, it is of necessity highly speculative, for,

[1] Published by permission of the Director of the U. S. Geological Survey.

[2] White, David, Unmined Supply of Petroleum in the United States, Journal, Society of Automotive Engineers, vol. 12, No. 5, 1919, pp. 361–363. Estimates for the various regions are given on p. 362.

as every geologist knows, an estimate of a commodity so intangible and fickle as oil in the ground, especially in undeveloped and untested regions, is, at best, one in which many of the elements are merely scientifically calculated guesses in the formulation of which all lines of evidence are taken into account and weighed with the experience and judgment acquired in other regions. However, conceding that for many areas in the country the information is very fragmentary and inadequate, that there are many factors controlling the distribution of petroleum that are not yet understood by geologists, and that consequently such an estimate must necessarily be wildly speculative and subject to great latitude of error, it may nevertheless be argued that the progress of geologic examinations of the country and of exploration by the drill has gone so far, the principal factors of oil control are sufficiently proven, and the results of development are now so voluminous that it is highly improbable that the error is more than 50 percent. An error of 75 percent seems so improbable as not to justify serious consideration at present.

On the basis of an estimated 6,740 million barrels available in the ground in January 1919, there should now (February 1920) remain, in round numbers, 6,325 million barrels. However, as stated, this estimate was published as distinctly conservative, though mention of this fact has not been made by those quoting it. At the present moment it appears as unlikely that the amount of oil that will actually be recovered will fall under 6 million barrels as that it will be found to be more than 8 million barrels, or about 25 percent in excess. Therefore, viewing 6,325 million barrels as distinctly conservative, 7 billion barrels may be regarded as a moderate but not distinctly liberal estimate of the oil remaining available in the ground in the United States February 1920.[8] The estimate is subject to revision as exploration, including both the investigations by the geologists and tests by the drill, goes forward, and it will be revised from time to time.

Progress in exhaustion of domestic deposits

Oil is now being taken from the ground in the United States at a rate very closely approaching 400 million barrels per annum. This is five times the rate in 1901 and twice that of 1909. At the close of 1919 approximately 4,986,300,000 (nearly 5 billion) barrels of oil had been produced in this country, since the Drake well was drilled in 1859. This is about 43 percent of the original recoverable contents as estimated. All this oil that has been mined in the United States in 60 years would be taken out in 13 years at the present rate of production. Impressive as this fact may be, it is less alarming than the realization that the recoverable oil in this country, according to the conservative estimate, would probably be practically exhausted in 17 years if the 1919 rate (nearly 380 million barrels) of production could be maintained for so long, while a reserve of 7 billion barrels, the moderately liberal estimate, would disappear in 18½ years. If an improbable excess of 2,500 million barrels over the estimated amount be present, this excess would be enough to sustain the present draught for 6½ years adidtional.

What improvements will in the next 10 years be made in the process of extraction of the oil from the ground, and what the effects may be in recovering the great amounts of oil not available or recoverable by present methods remains to be seen. It is most important that studious attention be given to the problem of the more complete extraction of the oil than is possible by the methods now in general use. The estimated available supply should be increased in this way to the maximum.

Fortunately, the oil cannot so soon be taken from the ground. Even unheard of prices for crude, and scourging of the ground far more severe than that now in progress cannot within the next generation disclose all the oil pools in the strata, and though devices for more rapid extraction may be invented and applied, the fields yet to be discovered cannot be drained so rapidly. Oil pools will be found, finally by accident, long after the search has waned and even in the next century. These are some of the reasons why, as will further be explained, the production of natural petroleum in the United States must pass its peak at an early date—probably within 5 years and possibly within 3 years—though the long sagging production curve may be carried out beyond the century.

The curve of the domestic production of petroleum, as compiled from statistics

[8] A more liberal estimate by my colleague, E. W. Shaw, is "8 or 10 billion barrels." Proc. Nat. Gas Assoc. America, Cleveland, May 20, 1919. The Income and Expense of Natural Gas Production, p. 6.

furnished by G. B. Richardson, geologist in charge of statistics of petroleum in the United States Geological Survey, is given in figure 1. It shows that for the last 8 years the annual increase in the petroleum production of the United States has averaged around 20 million barrels. The greatest increase (nearly 25 million barrels) in marketed production was in the war year, 1917. The actual production increase from 355,927,000 to nearly 378 million,[4] or about 22 million barrels in 1919, as indicated by Mr. Richardson's preliminary figures, was due mainly to the unprecedented advances in oil prices, which have been the cause of wildly speculative activity in the oil business throughout the country, and, in part, to the fortunately wide extent and the profuse initial productivity of the north-central Texas district.

In January 1919 when discussing the probable trend of the production of petroleum in the United States,[5] I expressed the view that the output of oil in 1919 could only with great difficulty be made to increase abreast of the increase of consumption in 1919, and that possibly within 3 years, and very probably within 7 years, the production of this country would pass its climax, notwithstanding the growing deficiency as compared with the needs of the country. The increase in the output for 1919 seems at first largely to controvert this conclusion or at least to put farther ahead the beginning of the decline. However, even its significance as indicating postponement of the evil day is likely to be overestimated. The trend of the production curve has been maintained and the output forced upward in 1919, mainly by a great increase of over 3,500 (14 percent) in wells drilled as compared with 1918,[6] and an enormous influx of capital, notwithstanding great and inexcusable waste of the latter. The energy, funds, and equipment applied to the winning of oil from the ground promise to be even greater in 1920, though many holders of stock in the hordes of misguided or fraudulent oil companies are doomed to disappointment. In view of the augmenting forces concentrated in the struggle and the considerable proven areas of very rich territory ready for drilling, it seems probable not only that the 1919 rate of petroleum production will be more than maintained in 1920, but that, under the favoring influence of high prices still advancing and the prospect of a continued increase in consumption, the normal annual increase of 1919 will be exceeded. Besides responding to increased costs of production, the remarkable advances in crude oil prices are to be regarded as reflecting also both the deficiency in our domestic output and an apprehended difficulty in securing foreign oil in amounts sufficient to satisfy our growing requirements.

As north-central Texas (the so-called Ranger district) falls off in pertroleum yield it is probable that the domestic output will receive support from the formerly withdrawn and other public oil lands in Wyoming and California which are at this moment being made available for leasing; the Gulf Coastal Plain will doubtless for a long time make contributions, with Louisiana giving immediate assistance, and the Midcontinent region—the Osage for example—undoubtedly contains important undiscovered pools. With the decline of the Ranger district, oil companies will give attention to regions hitherto regarded as more or less unfavorable, and older oil States will be rexamined. Oil will be found and developed in some of the regions of Wyoming, Utah, Colorado, Montana, and Alaska, which are not now viewed very hopefully, and, probably, New Mexico, Washington, Oregon, and some other possible States. Oil men are certain to return to find new production, probably in minor amounts, in Kentucky and will more thoroughly search Illinois, Indiana, Tennessee, and the northern Appalachian region. Michigan will surely be further tested, with chances for some success, notwithstanding the thick mantle of drift which so nearly blankets the underlying structure. Not only must regions formerly abandoned be subjected to a more drastic review with testing, and regions damaged by water treated by new methods, but also regions rejected without testing will be given the most scientific attention. The culls and discards must be tried out, so far as the prices of oil and the resultant proceeds of wildcatting permit. It is far from improbable that the time will come when, the oil companies being unwilling to assume the risks of drilling in portions of the country, the State or the Federal Government will in some emergency be asked to test with the drill the possibilities of these areas at public expense.

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[4] It is expected by Mr. Richardson that the statistics of oil used in the field, and other items not yet reported will raise the total production for 1919 to about 380 million barrels of 42 gallons.

[5] Journal, Association of American Automotive Engineers, vol. IV, No. 5, 1919, pp. 361–363. Printed in advance of meeting, February 4–6, 1919.

[6] Oil and Gas Journal, January 23, 1920, p. 50.

Meanwhile, as the production peaks of fields now are passed and the yields decline, new fields, either still larger or in greater numbers, must be discovered and thrown in to fill the cumulative void. Not only must the 1919 rate of production be sustained but also greater and still greater increases are demanded. To thus continue increasing the domestic oil production of the United States for any appreciable term of years now seems impossible, even under the present extraordinary price stimulus. Failure to secure adequate supplies from foreign fields at competitive prices, and consequent further advances of the prices for domestic crude oil would, of course, drive our output to a maximum limited by the reduction of consumption demands as costs become prohibitive. In such a case all predictions would of necessity be declared off. The development of such a situation should not, however, be permitted, and steps should be taken to assure the needed foreign supplies at all times. The welfare of the country demands it.

On the whole, therefore, after a review of the domestic fields, in which it threatens to be more more difficult and costly to sustain even the present production rate after the most promising regions now under development have passed their peaks, it appears highly probable that the United States will have passed is production peak within 5 years or very soon thereafter, and possibly within 3. Nothing is more certain than that this country must at an early date lose its supremacy in the oil world and become more and more dependent on the oil resources of other lands, except insofar as the situation may be saved by the successful production of artificial petroleum by the distillation of oil shales.

Oil from oil shales

No discussion of the petroleum resources of this country can overlook the great potential importance of our extensive oil shale deposits as possible sources of oil. The oil shale deposits of the United States are a possible source of oil in amounts far greater than all the available natural petroleum of this hemisphere. They form an enduring asset, sufficient to sustain an enormous ultimate load for an indefinite period. However, at present they are assets of undetermined cash value and, at best, difficult and slow of conversion or liquidation, and they cannot yet be drawn on to carry the burden of our petroleum requirements.

Oil shales are interbedded, sedimentary strata, consisting more or less largely of fossil organic debris and the decomposition products of plants and animals, probably mainly aquatic. When sufficiently free from clay, sand, or other mineral matter, the oil shale layers or beds present both physical and chemical features characteristic of cannel coals, to which they are genetically related and into which they grade. Like other members of the cannel group, these fossil organic deposits are characteristically high in hydrogen and when decomposed (distilled) by heat, they yield large proportions of volatile matter, much of which may be condensed as oils. The latter differ in composition and qualities according to the methods, temperatures, etc., of distillation, and, according to the process, it is probable that they will be made essentially to constitute artificial petroleums. Generally, and by ordinary, simple, dry distillation they are asphaltic but most of them will yield paraffin, and other waxes in considerable amounts, and all contain nitrogen which varies, however, very greatly in the shales from different regions and formations.

Oil shales, in deposits of considerable thickness and extent, are found in different parts of the United States, but generally the thick deposits yield but few gallons per ton, while the rich deposits, including the low-grade cannel coals, are extremely limited in extent. Enormous amounts, in many strata of great thickness and relatively large area, are found bedded like coal in the Green River (Eocene) formation of northwestern Colorado, northeastern Utah, and southwestern Wyoming, and in a formation probably Miocene in age in northern Nevada.[7]

Experimental tests show that some of the purer beds of oil shale yield over 70 gallons per ton and certain parts of some of the beds are claimed to yield

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[7] Winchester, D. E., Oil Shale in Northwestern Colorado and Adjacent Areas. U. S. Geological Survey Bulletin, 641, pp. 139–198, 1917.
Winchester, D. E., Oil Shale of the Uinta Basin, Northeastern Utah, and Results of Dry Distillation of Miscellaneous Shale Samples, U. S. Geological Survey Bulletin, 691, pp. 27–55, 1919.
Condit, D. D., Oil Shale in Western Montana, Southeastern Idaho, and Adjacent Parts of Wyoming and Utah, U. S. Geological Survey Bulletin, 711, pp. 15–40, 1919.
Ashley, G. H., Oil Resources of Black Shales of the Eastern United States, U. S. Geological Survey Bulletin, 641, pp. 311–324.

over 2 barrels per ton. D. E. Winchester, who has mapped many of the deposits for the United States Geological Survey, reports that in northwestern Colorado and northeastern Utah there is enough of this shale in beds 3 feet or more in thickness, and capable of yielding 22 gallons[8] or more of oil to the ton by distillation, to provide as much as 40 billion barrels of oil from which 5 billion barrels or more of gasoline should be extracted. Larger proportions of gasoline should be produced by the employment of proper methods. If the deposits of southwestern Wyoming and the small areas of rich shale in Nevada be added, the roughly estimated production mentioned above may be enormously increased—possibly doubled. Deposits of oil shale of limited extent, and generally less rich, are present in a number of States, namely, Pennsylvania, Indiana, Kentucky, Texas, Wisconsin, Michigan, and West Virginia.

What new oilfields may yet be discovered in other parts of the world, particularly the less explored regions, no one can foretell, but it seems probable not only that oil will be distilled from the shales of the Green River group long after the principal oilfields of the world have been exhausted, but also that the total amount that may be obtained from this source may approach the world's total production of natural petroleum. The fact that some of the rich deposits of phosphate in the Permian of Idaho and southwestern Montana are accompanied by shales, which on distillation yield small amounts of oil,[9] suggests an interesting problem for the consideration of the chemical engineer.

How soon oil may be produced in this country by the distillation of oil shale on an industrial scale at a commercial profit, and how rapid the production may grow remains to be demonstrated. Over 40 companies are said to have been honestly organized for the production of shale oil in Colorado and Utah, and many companies have been formed for the sale of stock. The shale-oil industry of this country is now in an experimental stage. A number of plants are already constructed or are building to try out different processes and conditions. Foremost among the elements to be determined are the best methods of retorting with reference to the recovery of the most valuable products, refining methods adapted to the particular shales in hand, and the possible byproducts and their relative importance. Other questions to be considered concern water supplies and transportation problems; the establishment of great plants; the building of towns, and the housing, feeding, etc., of a great industrial population numbering hundreds of thousands of men. The development of a great shale-oil industry is certain eventually to take place in this country, and, so far as concerns mere costs of production, it would seem that the recent advances in oil prices must bring it near to hand. Nevertheless, in view of the technological problems to be solved experimentally, it appears rather likely that shale oil will be sorely needed long before it is produced in amounts sufficient to bring appreciable relief, and much longer still before it can supply a large part of a consumption demand even no greater than that of the present day.

In view of this grave probability, the passage of the experimental stage, with its losses and waste of none too well guided capital, should be hastened by the establishment of testing plants and research laboratories by the Government and by wise and foresighted investigation and tests on the part of the stronger oil companies. It is absolutely a matter of insurance of the public and country.

Oil shale industries have enjoyed a long existence in Scotland, France, and Australia, and oil from Scotch shales helped the British Navy to victory. However, it is an interesting circumstance, reflecting possibly changed conditions, that just now, when we are driven to greater efforts to establish a shale-oil industry in this country, the work of the Scotch plants, formerly running on shales of low oil yield, but of unusually valuable byproducts, is being transferred to the refining of oils brought from British oil fields in the east, the labor costs being too high for the profitable utilization of the shale in competition with oil more cheaply produced in increasing volumes from the wells of Egypt, Persia, and India.

The use of oil shale is a means of relief of qualified adequacy, the benefit of which can at best be realized but slowly and laboriously. Our oil shales are an endowment of inestimable value on which we are certain, ultimately, to

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[8] The average production of the Scotch oil shale distilled in recent years is stated to approximate 22 gallons per ton.

[9] Condit, D. D., Oil Shale in Western oMntana, Southeastern Idaho, and Adjacent Parts of Wyoming and Utah, U. S. Geological Survey Bulletin, 711, pp. 15–40, 1919.

depend heavily, though the time and rate of that dependence will be largely controlled by the rate of development of foreign oil fields, the growth of the world demand, and by consequent competitive prices of natural oil.

Dangerous growth of consumption demands

The increase, both present and prospective, in the consumption demands for petroleum in the United States is hardly less alarming than our growing dependency on foreign petroleum supplies, for if in recent years the United States has furnished very close to 66 percent of the world's whole output of petroleum, our oil industry is reported nevertheless to have at the same time demanded more than we produce, this demand having amounted to over 80 percent of the world's output in 1919. To the extent of nearly 47 million barrels the United States is already living beyond her income.

The gap between the oil production and consumption curves, illustrated in figure 1, has not been eliminated even in the past year of inadequate automotive production and postwar readjustment; thus, while in 1919 our domestic oil production was forced to an increase of nearly 25 million barrels (7 percent), our net importations of foreign oil—i. e., the excess of imports over exports of crude—gained 14 million barrels (43 percent). The oil requirements of the petroleum industry in the United States during the last year (1919) were, according to the preliminary returns, compiled by G. B. Richardson, of the United States Geological Survey, approximately 418,400,000 barrels, not including oil used on the leases, or probably nearly 421 million in all.

It is stated that of about 8 million motorcars, in round numbers, in the world over 7,600,000 are in this country, which has been estimated to contain over 90 percent of all the internal-combustion engines. It is calculated also that the number of motorcars will ultimately exceed 12 million, if it is not restricted by fuel prices. Moreover, we are told in this connection that the orders in the hands of some of the large motor manufacturers are a year or more in arrears, and that internal combusion engines in vast numbers are to be made for tractors, airplane transportation services, launches, pumps, farm machinery and small power purposes throughout the country. On every hand new uses for oil are being devised and old applications multiplied. Not even the recent increase in prices of gasoline and other byproducts can be seen to have caused a perceptible slackening in the rate of increase of consumption or to have curtailed plans for the more widespread and varied use of petroleum.

Not the least of the important consequences of the coal strike of last autumn has been the public apprehension of still higher coal prices, on account of which arrangements have been made or are making for the substitution of fuel oil for coal on railroads, on ships, in shops, powerhouses, and even in heating plants, thus adding more millions, the sum of which cannot yet be counted, to the drain on our available oil resources. Further advances in the prices of coal cannot fail further to increase these consumption demands unless scarcity of oil from any source acts automatically as a check. The use of oil under steam boilers at an efficiency of 10 to 15 percent in the generation of steam, when its use in the diesel engine would give an efficiency of 25 to 30 percent, is a criminal waste, for which even the present generation may well be called to account.

Between 1909 and 1918 the production of crude petroleum in the United States increased 95 percent (see fig. 1), but the production of gasoline, as compiled by the United States Bureau of Mines, increased from around 13 million barrels to 85 million barrels, or 560 percent, in the same period, while the number of automobiles and trucks increased 1,700 percent. The consumption of fuel oil by vessels engaged in foreign trade in 1919 was nearly double that of 1918. These examples illustrate the rapidity with which our industries, our commerce, and our standards of living have become dependent on petroleum, the third in value of our great mineral products.

Dependence of United States on foreign oil

As already noted, the production [20] of petroleum from the oilfields in the United States during 1919, according to the preliminary statement by G. B. Richardson, of the United States Geological Survey, was 377,719,000 barrels, of which 371,579,000 barrels were delivered to refineries and other consumers in this country, leaving about 6,140,000 barrels which were added to stocks held by pipeline, and other marketing companies. The increase of production was 6.12 percent, while the increase in wells drilled [21] was 14 percent. However, any sense of security

[20] Exclusive of oil consumed on leases and of producers' stocks except in California.
[21] Oil and Gas Journal, Tulsa, Okla., Jan. 23, 1920.

predicated on the addition of the small amount mentioned above of the domestic oil in storage fades away when it is recognized that the oil now in storage in the United States is not enough to supply this country for 4 months. For several months oil has been drawn out of storage, the draught for January 1920 being 700,000 barrels. On the other hand, the importation of crude oil into the United States from other countries (predominantly from Mexico) has increased from 37,735,641 million barrels in 1918 to 52,746,567 barrels in 1919, or 40 percent. Deducting for approximately 5,925,587 barrels of crude oil exported to other countries, the net excess of our imports over our exports of crude oil for the year 1919 amounted to 46,820,980 barrels, as compared to 32,834,950 barrels in 1918. The significant facts are not only the large total amount of foreign oil necessary to meet our requirements, but also the amount (14 million barrels) of the increase for the year. In short, our demand for foreign oil has increased over 42 percent during 1919, notwithstanding the temporary handicaps of both commerce and industry. Reports received for January 1920 show a net importation for that month of 5,865,293 barrels, a rate of 52 percent increase over 1919.

The reports of the Bureau of Foreign and Domestic Commerce [12] show that during the fiscal year [13] ending June 30, 1919, the total oil exports of the United States, including both crude and refined oils, such as fuel, gas, illuminating and lubricating oils, gasoline, light distillation products and residuum, altogether amounting to approximately 60,215,831 barrels, were about 5 million barrels, or 8 percent less than during the preceding fiscal year. But for this falling off in our exportation of refining products due, in part, to postwar difficulties of industrial and financial readjustment in Europe, the actual increase in our importations must have been very nearly, if not quite as great as, the increase gained at great labor and cost, in our domestic production, and this in the face of increased prices for crude oil and oil products.

The program of the United States Shipping Board is reported to provide for an aggregate of 1,734 oil-burning merchant ships by 1922. To drive this merchant marine the board has called for 50 million barrels of fuel oil for the year 1920, and 30 million barrels for the first half of 1921. At this rate it may be anticipated that the fuel oil requirements for the last half of 1921 will be near or over 40 million barrels, and that the fleet, when completed, will require an annual supply of between 70 and 90 million barrels. This merchant marine supply, which is approximately equivalent to one-half of all the fuel oil now produced in the United States constitutes a new burden superimposed on an already overloaded demand, and in its entirety or its equivalent must be drawn from foreign sources. If the requirements of our growing Navy be added, the demands for oil for sea use will probably approximate 100 million barrels of fuel oil per year. The people of the United States will doubtless curtail their use to assure oil for the Navy, but whether they will willingly go without oil at home on account of pride in the merchant marine, and in order that the ships under our flag may have ample supplies of oil as cheap as those obtained by rival ships in all parts of the world, seems extremely doubtful. It is interesting to note that our oil companies, including those operating in Mexico and Central America, are at present (March 1920) dilatory in making contracts with the Shipping Board for more than a small part of the oil needed by our ships in 1920.

A British oil economist calculates [14] that by 1925 the petroleum requirements of the United States will exceed 500 million barrels and that at a later date America will become more and more dependent upon British supplies. Another high authority, W. C. Teagle, president of the Standard Oil Co. of New Jersey, estimates [15] that in 1925 the requirements of the petroleum industry in this country will approximate 650 million barrels, an increase of more than 220 million barrels over the requirements of 1919. Unless conservation of oil through curtailment of use—for example, as fuel burned under steam boilers to generate steam—is forced automatically by scarcity of oil and consequent prohibitive prices, or is sooner and more wisely brought about artificially by regulation, it seems probable to the writer that the demands of our oil industry will considerably exceed 600 million barrels, or possibly 650 million, as estimated by Mr. Teagle in 1925, though by that time our exportation of refined oils to some of the foreign markets will probably be reduced by competition of foreign oils nearer at hand and more cheaply produced.[16]

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[12] Commerce Reports, No. 39, Feb. 16, 1920, p. 932.
[13] All other figures in this paper are for calendar years.
[14] Oil and Gas Journal, Tulsa, Okla., Nov. 20, 1920.
[15] Oil Trade and Drug Reporter, New York, Feb. 2, 1920, p. 15.
[16] However, the use of petroleum products in countries where they are now used to a slight extent or not at all is likely, on the whole, to greatly expand the market and strengthen it.

A drain of over one-half billion barrels, even if the annual demand be not further increased, would, if taken from the oilfields of the United States, probably exhaust the oil resources remaining available in the ground in 14 years, or in 16 years, if we assume that our recoverable oil possibly amounts to so much as 8 billion barrels, which, to the writer, seems very improbable. It is fortunate for the country that the oil cannot so rapidly be extracted. On the other hand, it also seems to the writer quite improbable that an annual production of natural petroleum amounting to so much as 450 barrels can be won in any year from our domestic oilfields, the peak of whose production is likely to be passed by 1925.

On the whole, therefore, we must expect that, unless our consumption is checked, we shall by 1925 be dependent on foreign oilfields to the extent of 150 million barrels and possibly as much as 200 million of crude each year, except insofar as the situation may by that time, perhaps, be helped to a slight extent by shale oil. Add to this probability the other greater probability that within 5 years—perhaps 3 years only—our domestic production will begin to fall off with increasing rapidity, due to the exhaustion of our reserves, and it becomes evident that, except for such relief as may come from shale-oil production, America's future in oil will yearly become more and more completely dependent on supplies to be brought from foreign fields. This we cannot evade and must prepare for.

FOREIGN OIL RESOURCES

Estimates of recoverable oil in other countries

No estimate really worthy of the name can yet be made of the oil resources of the world. The best that can be offered is a scientific guess carefully formulated on the basis of the data now available and necessarily subject to an enormous coefficient of error. Of the important producing oil regions in other countries, only Rumania, Galicia, and the Baku and Grosny districts of Russia are so far developed as to offer criteria comparable to those of the United States for the estimation of their oil reserves. In none of the producing or prospective oil regions of other countries in which are located the great oilfields of the rest of the world have the geologic data been published, and in particular have the stratigraphy and structure been so far described by specialists in the geology of oil fields, as are the producing and prospective fields of the United States.

In many of the other countries, of which Mexico is an illustration, the detailed geological examinations, possibly accompanied by tests by the drill, have been confined to restricted areas, with but reconnaissance or even more indefinite data as to the remaining regions, which, on account of scattered surface indications or other criteria are believed to be oil bearing to an important degree. In some regions we have only the evidence of oil and gas seeps and pitch or asphalt deposits scattered in greater or less abundance over great areas, in which general geologic conditions similar in essential characters to those of producing districts, are reported to prevail. In other regions, of which the Near East, including Mesopotamia and Persia, offers the most striking example, a tremendous potential value is predicated with reasonable safety on the character, relative abundance, and widespread distribution of well-recognized surface indications of the presence of petroleum, though geological deails are meager, and actual oil production—the latter in great abundance—is essentially restricted to comparatively few areas, the wells being mostly confined to a small area of testing in the upper part of the Karun River Basin.

In countries like the Philippine Islands, Madagascar and Australia, the indications leave no doubt as to the presence of potential oilfields of some importance, but the geological information and developmental results where tests have been made are quite insufficient to permit an estimate deserving confidence as to the relative consequence of their oil resources. In portions of many of the countries it is possible only to base deductions as to probable oil contents upon analogies drawn after careful study of the data as to surface conditions and geologic relations, and a comparison of these with those of other regions in which exploitation has demonstrated the extent of the oil deposits. Hence, while the oil resources of Rumania, Galicia, and the Baku district, and a number of the older but relatively insignificant areas of western Europe, such as the Italian and Alsatian fields and the field in northwest Germany, can be roughly estimated, with a range of probable error in some cases as close as in the estimates of the oil in the United States, the reliability of the forecasts of the oil contents of the remaining regions ranges all the way to carefully made and conservative guesses, based on whatever information is in hand, with due consideration of the kind as well as the amount of the fundamental data.

Unfortunately, some of the most important prospective oil regions of the world fall into the latter category. On account of this fact, any estimates made by any geologist of the oil resources of the world are likely to differ from those made by any other geologist, are subject to revision from time to time as more adequate information accumulates, and must not be given a weight of authority which they do not deserve.

The general distribution of the principal petroleum reserves of the world, so far as they are demonstrated by development supplemented by favorable geological data and reported surface indications of oil, has been somewhat diagrammatically represented by Mr. Eugene Stebinger, Chief of the Foreign Minerals Section in the United States Geological Survey on a map here shown as plate I. The circles, drawn in different sizes to indicate the relative importance of the estimated oil reserves of the different regions, are centered near the centers of the actually productive or prospective oilfields, though the geographic distribution of the oil indications, as in Argentina for example, may extend through great stretches of country. No attempt is made to show all regions in which oil indications are reported, but concerning which the evidence in hand is not sufficient to prove them to be important.

To avoid the appearance of unwarranted exactness and finality, Mr. Stebinger tentatively represents his somewhat generalized conclusions as to the amounts of the oil reserves in each area by graphs in which the oil is shown in terms of relative importance or quantity, rather than in terms of barrels or metric tons. It will be noted that for a number of areas, like Bolivia, northern Argentina, and China, where little or no boring has been done at promising localities, the relative importance of the oil resources is shown by unshaded circles in contrast with shaded ones for the fields with settled production.

In the following table are given Mr. Stebinger's estimates for the regions represented by the circles on his map as grouped according to political boundaries or to natural petroleum provinces which transgress national boundaries. This table expresses, first, the relative values of these groups as compared with unit value for the United States, and, second, the corresponding quantities when unit value for the United States is 7 billion barrels, the moderately liberal estimate for the petroleum of the United States. Totals are also given separately for the Eastern and Western Hemispheres and for areas north of the Equator and south of the Equator. In submitting these estimates which, through his courtesy, are here published for the first time, Mr. Stebinger calls attention to the fact that these totals suggest a surprisingly evenly balanced distribution of oil between the Eastern and Western Hemispheres, and, as with the distribution of the world's coal reserves, a great preponderance of tonnage north of the Equator.

Oil resources of the regions represented by circles on the world map, Plate I, as estimated by Eugene Stebinger, of the U. S. Geological Survey

Country or region	Relative value	Millions of barrels
United States and Alaska	1.00	7,000
Canada	.14	995
Mexico	.65	4,525
Northern South America including Peru	.82	5,730
Southern South America, including Bolivia	.51	3,550
Algeria and Egypt	.13	925
Persia and Mesopotamia	.83	5,820
Southeast Russia, southwest Siberia and the region of the Caucasus	.83	5,830
Rumania, Galicia and western Europe	.16	1,135
Northern Russia and Saghalien	.13	925
Japan and Formosa	.18	1,235
China	.20	1,375
India	.14	995
East Indies	.43	3,015
Total	6.15	43,055
Total Eastern Hemisphere	3.03	21,255
Total Western Hemisphere	3.12	21,800
Total north of Equator	5.20	36,400
Total south of Equator	.95	6,655

As indicated in the preceding table, the natural petroleum resources of those regions of the world, for which the relative amounts are tentatively indicated by circles of different magnitudes on the map, are estimated at approximately 43

billions of barrels. Far as it may be from the exact amount, this total is to be regarded as conservative not only because it represents the cautious judgment of a well-trained and experienced oil and gas geologist based on the best information available at the present time, but also for the reason that the value assigned to the oil fields of the United States is conservative. It is to be expected, and it is certain that the appraisals of the different regions roughly indicated on the map will undergo radical changes as development proceeds and geological exploration is carried on in greater detail and with special reference to oil possibilities, and it is, of course, possible that the reserves may in some instances have been overestimated; but it is highly probable, on the other hand, that in many of the less civilized and geologically less known regions, the actual reserves may prove to be much, perhaps many times greater, than has been tentatively estimated.

It is to be noted that (1) no value is given on the map or in the above table for the oil resources of the regions market by squares; (2) oil indications are known in regions not indicated on the map by any symbol, although in most such instances the geologic conditions seem to preclude reserves of great importance; and (3) finally, there are in other countries many untested regions in which the geological conditions appear to be favorable for the occurrence of oil fields, though surface indications of oil have not yet been reported, possibly due in part to insufficient exploration. In this connection it will be remembered that in many oil fields in the United States the oil deposits are not indicated at the surface by such features as oil or gas springs, tar or asphalt deposits, etc.

It is highly probable that oil in considerable amounts will eventually be discovered in areas of northwest Canada, where only a limited commercial production has so far been obtained. Other foreign areas in North America which seem likely to make contributions, possibly of minor importance, to the world's supply, include Central America, Santo Domingo, and Lower California. In South America important new centers of production seem probable along a very extensive stretch of territory bordering the east slopes of the Andes, and, in addition, the gently flexed Paleozoic and Mesozoic areas of northeastern Brazil would seem to be possibly oil bearing. Madagascar offers much promise; and conditions favorable for developing oilfields appear to be present not only in Angola and other regions of west Africa, but possibly in east Africa also, while it is more than probable that the northern part of this great continent will finally reveal stores of oil more widespread and far greater in amount than is indicated on the map. Australia, Tasmania, and New Zealand may yet disclose producing areas of value and it seems reasonable to expect new discoveries of importance in parts of India not indicated by circles. Arabia, Palestine, Armenia, and Anatolia all offer thoroughly circumstantial indications.[17] Also it seems rather probable that oil will be produced in portions of Spain, Austria, and other countries of Western Europe where, as until recently in Great Britain, its presence may have gone unsuspected. The relatively unaltered Carboniferous and Devonian basins of Russia are practically certain not merely to disclose new areas of production, but also to furnish extensive supplies of oil probably rich in lubricants, while Siberia, about which geological information is so greatly desired, and which is said to carry indications of oil deposits in Transcaspia, Turkestan, Kamchatka, and notably in northern Saghalien, may reasonably be expected to contain oil bearing areas in other regions of its Tertiary, Mesozoic, and Paleozoic formations. China, in which kerosene is reported to be selling now at $1.40 per gallon, has oil indications in four at least of her provinces. It appears probable that oil is present in Tertiary and Mesozoic basins, scattered from Persia and Transcaspia eastward as far, at least, as Gobi. Finally, the results of slight testing at a few points and the evidence of numerous oil seeps in a number of the Philippine Islands, as recently summarized by Warren D. Smith,[18] make fairly certain the presence of commercial oil deposits in these islands, which should be examined and fully tested by the United States, for, on account of their geographical positions with reference to world commerce, the oil deposits of these islands may be found to be of particular value to the Navy and merchant ships of this country.

The evidence as to the probable presence of additional oil reserves in the areas just reviewed is in most cases insufficient to serve as a basis for more than the

[17] See Schweer, Walther, Die türkische-persischen Erdölvorkommen, Abh. Hamburg. Kolonjeninstituts, vol. 40, 1919.

[18] Smith, Warren Du Pré, Petroleum in the Philippines, Transactions American Institute of Mining and Metallurgical Engineers, advance publication, February 1920.

wildest forecast. However, these forecasts, or geological guesses, formulated conservatively with the probability that deficiencies will be very much more than compensated by excesses, lead me to conclude that there are probably 20 billion barrels of oil available in the world in addition to the 43 billion barrels contained in the regions covered by Mr. Stebinger's estimates quoted above, or as much in round numbers, as 60 billions of barrels in all. Mr. Stebinger's estimate of the oil in the regions indicated by circles may be roughly distinguished as oil in sight; that of 60 billions as total recoverable oil. This estimate of the world's total recoverable petroleum resources, in which Mr. Stebinger concurs, may differ very widely from estimates by other geologists, but we regard it as fairly conservative. It will, we believe, fall considerably within the ultimate recovery of natural petroleum now remaining in the world's underground storage.

Strongly in contrast with the oil reserves (oil in sight) of the principal known regions as indicated on the map, plate I, is the relative rate of annual draft on the fields to supply the world's uses, which in plate II is shown in blocks definite in scale and based on the production records. A glance of comparison at these maps shows cause for alarm that can only increase when the situation is considered more in detail.

The production of oil in the United States during 1919 approximated 378 million barrels, while our consumption requirements called for the addition of 47 million barrels of foreign oil in excess of the amount of crude petroleum exported by us to other countries, the total net requirements of the American oil industry for the year being over 418 million barrels. It has been noted also that, barring financial disaster or further oil shortage and consequent prices markedly restrictive of consumption, the annual petroleum requirements of the United States are likely, by 1925, to exceed 600 million barrels. It has also been pointed out that our domestic production which may not go over 425 million barrels a year—and is not likely ever to exceed 450 millions of barrels—would exhaust the estimated 7 billion barrels of natural petroleum remaining available in the ground in the United States in 18 years if the reserves could be drained continuously, at the present rate, to the last barrel.

Contrast this situation and its disheartening prospect with the situation of the rest of the world. A review of the accompanying table of world petroleum production, complied by G. B. Richardson of the United States Geological Survey, shows that over 60 percent of the oil produced in the world since 1857 has been drawn from the stores of the United States, and that in 1918, 69 percent of the world's oil supply came from our reserves. The collective consumption requirements of all countries outside of the United States[19] appear at the present moment to impose a drain on the oil resources of the rest of the world (outside of the United States) a little less than one-half as large as the annual draft on the oil fields of our own country, or, in round numbers, about 180 million barrels annually. Therefore, if this rate of annual drain on the oil reserves of the rest of the world be similarly maintained to the exhaustion of the last barrel, the reserves of foreign "oil in sight," i. e., 36 billion barrels, should last 200 years, while, the total reserves of 53 billion barrels[20] in the rest of the world should suffice for nearly 300 years. Oil for the United States for 18 years, at the present rate, and oil for the rest of the world for 300 years.

[19] The net importation of petroleum by the United States may here be regarded as nearly balanced by the exports of refined oils, fuel oils, lubricants, and residuum to other countries. See Commerce Reports, No. 39, February 16, 1920, p. 932.

[20] Total world's recoverable petroleum less that of the United States.

World's production of crude petroleum in 1918 and since 1857, by countries, compiled by G. B. Richardson, U. S. Geological Survey

Country	Production, 1918			Total production, 1857–1918		
	Barrels of 42 gallons	Metric tons	Percent of total	Barrels of 42 gallons	Metric tons	Percent of total
United States	355,927,716	47,457,029	69.15	4,608,571,719	614,476,230	61.42
Mexico	63,828,327	9,506,289	12.40	285,182,489	42,564,549	3.80
Russia	40,456,182	5,520,066	7.86	1,873,039,199	247,856,218	24.96
Dutch East Indies [1]	13,284,936	1,836,914	2.58	188,388,513	25,465,114	2.51
Rumania	8,730,235	1,214,219	1.70	151,408,411	21,058,193	2.02
India	[2] 8,000,000	1,066,667	1.55	106,162,365	14,154,982	1.41
Persia	7,200,000	[2] 1,000,000	1.40	14,056,063	2,952,231	.19
Galicia	5,591,620	777,640	1.09	154,051,273	21,424,303	2.05
Peru	[2] 2,536,102	338,147	.49	24,414,387	3,255,251	.33
Japan and Formosa	2,449,069	326,543	.48	38,498,247	5,133,100	.51
Trinidad	2,082,068	289,578	.40	7,432,391	1,033,712	.10
Egypt	2,079,750	277,300	.40	4,848,436	646,458	.07
Argentina	1,321,315	192,612	.26	4,296,093	617,176	.06
Germany	711,260	[2] 100,000	.14	16,664,121	2,254,974	.22
Canada	304,741	40,632	.06	24,425,770	3,256,769	.33
Venezuela	190,080	26,400	.04	317,823	44,142	.02
Italy	35,953	[2] 5,000		973,671	138,588	
Cuba				19,167	2,662	
Other countries				397,000	55,139	
Total	514,729,354	69,975,036	100.00	7,503,147,138	1,006,389,791	100.00

[1] Includes British Borneo.
[2] Estimated.
[3] Estimated in part.

Peril of the United States

It is possible that under the current unprecedented stimulus our domestic production of natural petroleum may be brought up to what the writer considers an improbable maximum of 450 million barrels per annum within the next 3 years, if ever, but it seems very doubtful whether the oil fields of this country can be goaded to a yield greater than that. Much depends on whether lucky strikes are bunched or irregularly scattered through a long interval. It has been shown not only that such a rate of production would probably exhaust our oil fields in about 16 years but also, on the other hand, that the turn soon must come when our production will begin to sag and decline. Already the American petroleum industry has outgrown the capacity of our oil fields and even now it is to the extent of over 50 million barrels [21] yearly dependent upon oil from foreign sources. This amount is included in the 180 million barrels drawn against the deposits of other countries. What then shall we do, when to our present overdraught must be added the millions by the hundred additional that will be required not only to meet the prospective growth of our rapidly increasing demands for oil for automobiles, trucks, tractors, airplanes, more railways, powerplants, vast new machinery, the Navy, and the merchant marine, but also, later, to replace a waning domestic production?

The growing American consumption of petroleum, which at present seems almost irrepressible, may constitute one of the greatest menaces to the future prosperity of the United States and to its later equality of competition with the rest of the world. In America the use of oil for all purposes for which it is more convenient, or more economical, is practically unbridled. We have not only made its higher uses raise the standards of civilization, but, without thought of the future, we have unrestrainedly degraded it to its grossest and most wasteful employment. We have developed the most extravagant habits, which in time are becoming necessities, until our oil industries now require over 80 percent of the world's output. With one-eighth as much oil in the ground as has the rest of the world, we are calling for four times as much as all other countries together. The total oil resources of Galicia estimated by a European engineer at 47 million tons [22] would not meet the requirements of the United States for a single year. If all available oil in the world be 60 billion barrels, as above estimated, and this were to be reserved for the exclusive use of the United States, it would satisfy

[21] Net imports for January 1920, were at the rate of 70,383,000 barrels per annum.
[22] Commerce Reports, No. 43, p. 1042, February 20, 1920.

our 1919 rate of consumption demands—not to mention the future—for but 140 years.

There is no substitute for petroleum except some other one or more mineral oils. Alcohol for use in internal combustion engines and vegetable oils for lubrication cannot be produced in the stupendous amounts required for present needs without destructively competing with foods and other vegetable products, which the public cannot and will not sacrifice on such magnitude of scale for the sake of building up foreign commerce or supplying our Navy. This has in effect been proved by the history of the last 10 years. On the other hand, as Mr. Requa has pointed out, the establishment of a shale oil production, capable of replacing the present output of natural petroleum in the United States, will require the organization of an industry with a labor complement practically equal to that of our present coal mining industry. Such a work, which has to be built up from the bottom, including transportation, the founding of cities and enormous operative works, cannot be accomplished in a few years; the labor strain alone would be too great. There will be no flowing wells in the shale regions; every ton represents individual labor and costs of mining, preparation, and reduction. Oil shale is a bulkhead, the distance to and efficiency of which cannot yet be clearly seen. Oil from any source, shale or other, must be as abundant and must be marketed as cheaply in the United States as oil is had in other countries if this country is not to be subjected to economic handicaps to its prosperity and progress.

The oil situation confronting the United States is genuinely critical and demands the most sober thought and wise but prompt action. It is time to call a halt and inquire whither we are drifting and where we shall end. Prevention of waste, restriction of employment, and greater efficiency in recovery and in use will give great assistance, but all combined will not meet the situation nor solve the problem. The United States must either assure itself of sufficient oil for the future, or it must change its habits and cut down its use of oil. Curtailment, probably drastic, will in any event ultimately be forced to some extent, notwithstanding the production of oil from shale, and the public cannot too soon ask itself as to what extent the inefficient use of oil to generate steam in boilers is to be tolerated—not to say increased. On the other hand, the acquisition of sufficient reserves by our nationals should assure cheaper and more abundant oil, relieving the financial and industrial pressure to be endured as the compulsory dependence of the United States on an oil-shale industry eventually becomes more widespread and complete. This country should not bear the industrial burden of advanced dependence on oil shale so long as there are ample stores of oil to be produced and brought more cheaply from some other quarter of the world.

IMMEDIATE ACTION FOR PROTECTION OF THE UNITED STATES NECESSARY

Plainly, if the United States is to have oil to satisfy its needs in the future, it must secure adequate reserves in foreign countries, buy oil from foreign oil companies, or depend on oil-shale production to fill the void. To depend on oil shale is to trust to uncertainties both as to costs and as to ultimate results, and, as has been noted, is at best to superimpose on our present social and industrial fabric an enormous and complex new industry rivaling our coal mining, salvaging but a part of our present oil industry and requiring many years for its development. Sooner or later—perhaps within a year—a commercial shale-oil industry may be born in this country, but that it can originate soon enough or become large enough to offer any considerable contribution before our domestic petroleum production is already on the wane seems to the writer improbable. Shale-oil production cannot be made to meet any emergency demands that may meanwhile arise. Finally, if shale oil yielding the principal and indispensable petroleum-products, cannot successfully be produced and marketed as cheaply as natural petroleum from other countries, the public cannot be expected to build up and sustain a shale-oil industry, unless it be under subsidy as a protective measure.

As the outlook must now be viewed, it is practically certain that after a time America will be buying oil from our commercial rivals in quantities greater by far than we have ever sold to them, to say nothing of the prices paid. But, while this may be inevitable, it surely should be escaped as far as possible. If we are to have these oils as cheaply as they are sold in the home countries; if our industries, our transportation, our navy, and our standards of living are to be safeguarded in advantages as great as those of our rivals and if our mer-

chant ships are to get their fuel oil at prices as low as those paid by rival ships, the oil supplies needed must be in the control of our own nationals, not only now but throughout. Our prosperity and our prospects, so far as they may be affected by this important and indispensable mineral commodity which influences the daily life of every citizen, must not be subject to prejudicial regulation or discriminative restriction by any foreign power, whether ally or enemy. Only by assuring control of our nationals over the oil supplies required by this country can the protection of our future be guaranteed.

When, however, attention is given to the duty of assuring the oil reserves necessary to supply America as long as any other country enjoys an equal measure of oil adequacy we find many of the great oil regions of the world closed to us by our rivals who in many other regions have secured the lion's share or are now, with an efficiency possible only under governmental aid, ceaselessly gathering in all that is good.

On Mr. Stebinger's map are indicated roughly, (1) the regions in which American oil companies either cannot acquire concessions and produce and market the oil contents, or can do so only under restrictions making it necessary to more or less completely surrender control of the organization if not of actual operations to the nationals of some other country; and (2) those areas in which the citizens of this country may acquire concessions in accordance with essentially open-door policies. The differentiation shown on the map is tentative, possibly erroneous, and assuredly subject to revision, with, however, immediately prospective extensions of the first class.

The situation as it existed in May 1919, is summarized in a comprehensive and informing report submitted with recommendations by Director Van H. Manning of the United States Bureau of Mines to the Secretary of the Interior, and printed in the Congressional Record, for July 26, 1919 (see p. 3515). According to this report the nationals of the United States are, in general, either excluded from acquiring oil concessions in the territory, colonies, and dependencies and even in lands in the spheres of influence of Great Britain (with the exception of Canada), France, Japan, and the Netherlands, or permitted to do so only under restrictions and governmental privileges of authority that constitute either effective exclusion or loss of control and management according to the case.

It appears that aliens are excluded from prospecting for oil in Burma, India, Persia (wholly?), Uganda (probably) and the United Kingdom; and governmental policies of exclusion of other nationals from control of oil supplies obtained in Algeria, Australia, Barbadoes, British East Africa, British Guiana, France, French West Africa, Guatemala, Japan, Formosa, and Saghalien, Madagascar, Mexico (?) New Guinea, and probably in South Africa. Provision for the legal or administrative exclusion of aliens from most of these countries are already effective. Such provisions are met also in Venezuela and Uganda.

According to reports, mineral rights cannot be transferred to aliens in Australia, Barbadoes, British East Africa, British Guiana, the Dutch East Indies, France, French West Africa, Guatemala, Indian (probably), Madagascar, the United Kingdom, Japan (practically), Trinidad, in part, Venezuela (qualified) and, except that now held by other nationals, in Rumania and Slovakia.[28] It is stated that restrictions are placed on aliens in granting oil rights or concessions temporarily in two districts of Colombia, and, conditionally, in the new territory of Rumania.

Ownership of the oil in the ground rests in the Governments of Bolivia, Costa Rica, France, French West Africa, Slovakia, South Africa, Uganda, the United Kingdom, and Venezuela and, in part, in Argentina, Australia, British Guiana, Canada, Colombia, Ecuador, India, and Trinidad; and movements further to vest oil rights in the state are in progress in Colombia, in Dominican Republic, Mexico, Rumania, and Russia.

Whether oil lands in Mesopotamia, Palestine, the northern strip of Persia, Armenia, Arabia, Turkey, and German East Africa—all marked by queries on the may, plate I—will be open to access by our nationals after the mandates or other governmental arrangements are made for those countries remains to be seen. The present outlook does not inspire optimism.

Behind the curtain of secret diplomacy, the rich oil reserves of the unappropriated mandatories of the Near East and of the Caucasus-Trans-Caspian

[28] Domestic oil companies may not pass under foreign control in Australia, Barbadoes, British Guiana, Burma, the Dutch East Indies, France, French West Africa, Guatemala (?), Madagascar, Trinidad, the United Kingdom, and probably in India.

regions are stakes of a great game during which more than one political boundary is likely to be adjusted to meet the oil ambitions of a prospective protector, while in portions of Latin America, the stresses of commercial and political diplomacy are fully exerted to the disadvantages of our nationals. Even during the long war, oil geologists in the employ of the French, the British, and the organically allied Dutch Shell interests have been examining the most remote lands including some of the unstable countries, and in certain regions have carried on their search at the very heels of the armies. According to recent British oil news, the division of the Mesopotamian oil regions between the French and British has been agreed upon, and an understanding formulated in accordance with which Great Britain and her European allies will control the oil resources of the Mediterranean region.

Government participation in oil production is found in Argentina, Australia, Bohemia, Great Britain, and probably Egypt. The British Government has established a petroleum administration; owns a controlling partnership with veto powers on the board of directors in the Anglo-Persian Oil Co., which controls the oil resources of the greater part of Persia; gives financial assistance to its nationals engaged in oil development and is in every possible way promoting the acquisition by companies under British control or companies exclusively British, of oil reserves in all countries, including our own.

As the case now stands, our nationals are either distinctly or in effect shut out of the regions containing nearly one-half of the oil in sight in the rest of the world if the open-door policy is not assured in the mandatory countries. Further, if to the petroleum resources in the countries now held by Great Britain, France, and the Netherlands, there be added the concessions held by their nationals in producing or prospective oil regions of other countries, the total oil resources in the control of these nations will probably exceed three-fourths of the world's oil reserves outside of the United States. An open-door policy, in the mandatory countries, at least, is an economic necessity to the United States.

Such is the prospect confronting America, whose stores have to date furnished two-thirds of the world's petroleum supplies, whose growing requirements absorb over 80-percent of the world's present production, and whose reserves are estimated to be enough to meet her present consumption rate for less than 18 years. The increased use of the internal combustion engine, which, incidental to the great awakening following the war is already noticeable in the hitherto less progressive or even barbaric countries of the world, cannot fail to cause a great growth in the foreign demand for oil which, when once under way, will gain great momentum, thus bringing augmenting pressure from all sides in the world's competition for oil. In fact, it probably is no rash prediction to forecast a world's shortage of petroleum within the next 20 years, with the likelihood that the world's supplies will be insufficient within 15 years.

Most earnest warnings of the impending danger have been issued by Director George Otis Smith,[24] of the United States Geological Survey; Director Manning,[25] of the United States Bureau of Mines; Franklin K. Lane,[26] Secretary of the Interior; and M. L. Requa, Director of the Petroleum Division of the late Fuel Administration. A joint memorandum by Directors Manning and Smith, and Mr. Requa will be found in the Congressional Record above cited.

The situation as viewed from our rival's standpoint is analyzed with unusual perspective by E. Mackay Edgar in Sperling's Journal for September 1919, from which the following extracts are quoted as wholesome and profitable food for American thought:

"The time * * * is coming, is, indeed, well in sight, when the United States, partly through recklessly improvident exploitation and partly through natural processes of exhaustion, will be nearing the end of some of the available stocks of raw materials on which her industrial supremacy has been largely built. * * * The processes which have practically stripped Ireland of trees are operative in the United States over a far wider territory, on a yet more appalling scale, and in connection with many other sources of national wealth. The size and

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[24] Smith, George Otis, A Foreign Oil Supply for the United States, Transactions American Institute of Mining and Metallurgical Engineers, February 1920. Advance publication No. 157.

Smith, George Otis, Where the World Gets Its Oil, National Geographic magazine, February 1920, pp. 181–202.

[25] Manning, Van H., International Aspects of the Petroleum Industry, Transactions American Institute of Mining and Metallurgical Engineers, February 1920. Advance publication No. 158.

[26] Lane, Franklin K., Annual Report of the Secretary of the Interior for the Fiscal Year June 30, 1919, p. 13. (Republished as U. S. Geological Survey Bulletin 705.)

magnificence of the American inheritance and the rapidity and wantonness with which it has been squandered are an almost incredible commentary on human folly. On no country, perhaps, had affluent fortune emptied all her horn in such varied and bountiful profusion, and no country could have shown itself more utterly ungrateful. The Americans have dealt with their resources, and deal with them today, in the pioneer spirit of sheer, unmitigated pillage. * * *

"America has recklessly and in 60 years run through a legacy that, properly conserved, should have lasted her for at least a century and a half. * * * But the effects of 50 years of negligence and inefficiency are now becoming visible. Just when Americans have become accustomed to use 20 times as much oil per head as is used in Great Britain; just when invention has indefinitely expanded the need for oil in industry; just when it has grown to be as common and as true a saying that "oil is king" as it was 20 years ago that steel was king; just when the point has been reached where oil controls money instead of money controlling oil—the United States finds her chief source of domestic supply beginning to dry up and a time approaching when instead of ruling the oil market of the world she will have to compete with other countries for her share of the crude product. * * *

"America is running through her stores of domestic oil and is obliged to look abroad for future reserves and * * * these reserves, constituting a key position in international industry, are very largely in British hands or controlled by British capital. Before very long America will have to come to us for the petroleum she needs. * * *

"The main sources of the world's supply of oil in the near future will have to be looked for outside of America. * * *

"If Americans have failed to develop oilfields of their own in other lands, they will become more and more dependent upon foreign sources for the supply of one of the first necessaries of 20th century industry. Therefore, like the farsighted men they are, they are diligently scouring the world for new oilfields, only to find, almost wherever they turn, that British enterprise has been before them and that the control of all the most promising properties is in British hands. * * *

"When the industry revives in Russia and Rumania, in both of which countries the affiliated Royal Dutch companies were by far the largest producers, and when the Mexican wells are free to expand to their maximum capacity, the Shell group will be in control of not far short of a fourth of the world's supply. * * * The Shell group owns exclusive or controlling interests in every important oilfield in the world—in the United States, Russia, Mexico, the Dutch East Indies, Rumania, Egypt, Venezuela, Trinidad, India (where, in conjunction with the Burma Oil Co., it dominates the local position), Ceylon, the Malay States, North and South China, Siam, the Straits Settlements, and the Philippines. In the past few years it has been a particularly heavy investor in American oil properties. * * *

"Our true policy, therefore, while vigilantly proving and working such resources as we possess, is to encourage investment of British capital in oil, enterprises abroad, and especially in such parts of the world as are readily accessible to seapower, and to see to it by appropriate legislation that the companies so formed remain in perpetuity under British control. In one conspicuous instance, that of the Anglo-Persian Co., the Government has itself acquired a majority interest in the ordinary shares; and as the company has the exclusive right to exploit for a period of 60 years from 1901 the whole of the petroleum deposits in the Persian Empire, with the exception of the 5 northern provinces, and as the proved territory is now definitely known to be one of extraordinary richness—the wells already sunk have a potential production of 5 million tons a year—one may take it for granted that the British hold will not be relaxed. * * * With the exception of Mexico, and, to a lesser extent, Central America, the outer world is securely barricaded against an American invasion in force. There may be small isolated sallies, but there can never be a massed attack. The British position is impregnable. All the known oilfields, all the likely or probable oilfields, outside of the United States itself, are in British hands or under British management or control, or financed by British capital. We shall have to wait a few years yet before the full advantages of the situation begin to be reaped. But that the harvest will eventually be a great one can be no matter of doubt. To the tune of many million pounds a year America before very long will have to purchase from British companies, and to pay for in dollar currency, a progressively increasing proportion of the oil she cannot do without and is no longer able to furnish from her known stores. * * *

"We hold in our hands, then, the secure control of the future of the world's oil supply. We are sitting tight on what must soon become the lion's share of a raw material indispensable to every manufacturing country, intimately bound up with maritime power, and unobtainable in sufficient quantities outside of the spheres of British influence. It will be within the limits of the commanding position that the future has in store for us to hold up the entire world to ransom in the distribution and the price of this vital essential."

After making liberal deductions for patriotic vanity and bombast on the part of the British economist who, nevertheless, adduces unpleasant circumstantial data, the case as he presents it finds support to an alarming extent in the evidence already cited.

For the information of the reader, and for comparison with the estimates and forecasts by Mr. Stebinger and myself, the following is quoted from an editorial in the Financial News (London) of February 24, 1920:

"At the commencement of the war we believed that the effective British share of the oil resources of the world was about 2 percent. Careful admiralty calculations recently made have shown that it is now about 56 percent. This figure includes the Persian and Burma resources, but takes no account of the vast South American fields commanded by the British controlled oilfields. The exact amount of their contribution cannot, at the moment, be estimated with anything like precision. Probably a modest estimate might put it at another 19 percent. If that be so, our present command of the world's oil resources runs to no less than 75 percent of their entirety."

As Secretary Lane has urgently declared, in connection with his forceful recommendations to the President and Congress,[27] "the situation calls for a policy prompt, determined, and looking many years ahead." This situation cannot be neglected. Longer to ignore it is to court disaster. The smug complacency that habitually blinds the American public must be torn aside and the truth in its reality of danger faced squarely, courageously, justly, and wisely. An unprecedented crisis in our country may call for action without precedent. It is the business of the American oil companies and of the Government, working both separately and in such effective cooperation as will insure a successful outcome, to see to it that the future oil supply of America is guaranteed as fully as that of any other nation.

[Engineering and Mining Journal]

THE PETROLEUM INDUSTRY—OUR FUTURE OIL SUPPLY

(By David White)

The recent discussions of the oil resources of the world, of their political control, and, in particular, of the situation of the United States as to oil, have developed the existence of misapprehensions on both sides of the Atlantic. The confusion is due largely to the mental reaction caused by the close conjunction of the claims of British economists and statisticians, that Great Britain has acquired control of by far the greater part of the world's oil resources, with the statements of the political representatives of Great Britain that a small part only of the world's petroleum production is British, and that America holds a near monopoly of the world's supply of oil. On casual consideration these contentions appear to be in radical conflict, but in reality they bear only the appearance of contradiction. Broadly speaking, both assertions are not far from the truth. One refers to oil for the future; the other to the oil now taken from the ground each year.

BRITAIN CONTENDS UNITED STATES CONTROLS 80 PERCENT OF WORLD'S PETROLEUM

To the charge that Great Britain, through direct diplomatic action, through governmental cooperation, and even through partnership with her interlocking oil companies, has systematically and in some cases secretly been carrying out plans for the establishment of British dominance over the world's future oil supplies, the replies of the British spokesmen run along essentially identical lines. His Excellency the British Ambassador; Sir John Cadman, Government Petroleum Administrator of Great Britain; Lord Curzon, and many British journalists and editors all dilate on the preponderant position of the United States in the

[27] Annual Report of the Secretary of the Interior for the year ending 1919, p. 18.

world's petroleum production. They concentrate attention on the fact that the United States controls nearly 80 percent of all the oil now taken from the ground, and on the surprisingly small amount, said not to be more than 4½ percent, taken from British sources. They cite the vital need for assuring a supply for the British Navy, for all time, under British control; and all this is said with the polite implication that the Americans are seeking to perpetuate a monopoly, and are unconsciously, of course, unsportsmanlike. These seductive statements have soothed the apprehensions of many American hearers, and have served as the foundation for many misleading American editorials. The real issue—the question of oil for America when our oilfields are exhausted—is so far as possible, skillfully dodged.

The direct statements kept prominently in view by the representatives of the British are essentially true. The United States in 1919 produced from her oilfields, or handled as commerce, about 82 percent of the world's entire petroleum output, and owing to industrial and political conditions restricting the oil production of the European fields, our oil companies handled nearly 80 percent of all the oil mined in 1920. It is most obvious that at the present moment the United States vastly predominates in the world's oil production.

EARLY EXHAUSTION OF DOMESTIC FIELDS INEVITABLE

Beyond this present picture of opulence in oil may already be seen, casting their shadows across the path of our prosperity, the rapidly approaching exhaustion of our own oilfields before most of the great oil reserves of the world are touched; our inevitable loss of world dominance in oil at a relatively early date; a waning exportation of oil products and its unfavorable effect on our trade balance; and the prospect that, even for a restricted consumption, we shall be compelled to shift to other countries for ever-increasing importations to meet our necessities, except insofar as help, possibly at high or commercially disadvantage cost, may come from oil shales. We must expect these things, face them manfully, and plan wisely, thoroughly, and promptly to meet them.

The losing of our dominance in oil has begun. The greatest menace, however, lies in the fact that American oil companies are excluded from over half of the prospective oil territory of the world outside of our own country; in the fact that much the greater part, probably three-quarters, of the foreign oil resources of the world, including concessions held mainly by companies under control of the British, the French, the Japanese, and the Dutch, are already inaccessible to us, the greatest portion by far having been gathered into the control of the British; and in the most important fact that to secure the oil for our great consumption requirements, for our industries, our commerce, our merchant marine, our Navy, our air service, and our daily living, we may after a time be obliged to purchase largely from foreign companies under the control of a commercially competitive and conceivably unfriendly nation. In short, unless oil shale saves us at whatever economic handicap, the day is coming when our future in oil in no small part is likely to be at the mercy of a nation or combination of nations which at this moment are conniving not only to bring the oilfields of the Old World under their national control, but also, so far as practicable, to shut out our nationals from other regions, including the mandatory countries.

BRITISH OIL COMPANIES UNDER CONTROL OF GOVERNMENT

The San Remo agreement is one document, once secret, but now in evidence of this fact. If there is known to be one such convention, may there not be other secret agreements inimical to our interests, not yet brought to light? Provision is made that stockholdings in the newer British oil companies, including those in which the British Government is a partner, shall not pass from British hands. This bodes an evil day for the United States. If it is important to Britain that she assure herself of British control of adequate supplies of oil for her motors, her navy, and her merchant marine, as is absolutely logical and wise, is it not equally important that the oil on which the United States must depend be in the control of our nationals?

WASTEFULNESS AND OPEN-DOOR POLICY IN PETROLEUM PROGRAM

The British spokesmen chide us for our waste of oil in the past, which some of them offer as an excuse for present British policies. That the United States has been wasteful is true. It has taken our people a long time to learn the lesson of the value of oil and of its importance in the advance of civilization—

a lesson learned long ago by our mother country and put to profitable application even in the midst of hostilities. Our American fields were the first great oilfields of the world to be extensively developed. Widespread, accessible, and cheaply exploited, they have been drilled by an ever-increasing army of drillers, until for some years we have furnished the world with two-thirds of its annual supplies.

Meanwhile, in common with our copper, our iron, our coal, our silver, and other mineral deposits, oil territory in private ownership has from the first day been as open to development by the nationals of foreign countries as to our own citizens. Foreign owners of American companies and companies with American charters, but in the control of any other country, have until 1920[1] been as free as our own domestic corporations or nationals to buy, lease, and drill, even on the public lands of the United States, and to refine, transport, and market oil in this country or any other part of the world.

AMERICA'S RESOURCES DRAINED BY FOREIGN COMPANIES

The open-door policy is traditional in America. British, French, Dutch, German, Japanese, and Belgian capital has had a free hand in the development of our oilfields, and no inconsiderable part of our 1920 production, reported by G. B. Richardson, of the Geological Survey, to be approximately 443 million barrels of oil, was mined, transported, and sold over the world by British and British-Dutch companies. In fact, the amount of oil taken by foreign companies from our oilfields is nearly one-half as great as the total world's foreign production outside of Mexico.

British companies have organized and begun drilling operations in the mid-continent and gulf oil regions since the San Remo agreement was secretly passed between the representatives of Great Britain and France, and American geologists in British employ were outlining oil territory in Palestine and other parts of Asia Minor probably while the Peace Conference was sitting in Paris.

One cannot exhaust his oilfields and expect them to fill up again any more than he can eat his cake and keep it too. So, after 60 years, during which the United States has contributed generously to the supply of the rest of the world, while developing an extravagant consumption capacity herself, we find that her oilfields can no longer be made to meet her requirements. A taking account of stock by the United States Geological Survey shows that although in 1920 we produced oil at the rate of nearly 450 million barrels, the requirements of the petroleum industry called for about 531 million barrels—i. e., for over half a billion barrels per annum. Unless curbed by industrial depression, the total requirements will be larger in 1921.

The oil remaining in the American ground and recoverable by present methods of mining was in 1919 estimated by the Geological Survey at about 7 billion barrels—enough to meet the 1920 rate of requirements of the United States for 13 years, if it could be mined and made available so rapidly for use, which, of course, is impossible. At the consumption rate of 1919, this would suffice for over 18 years, but requirements increased more than 100 million barrels during the year. The estimates made by the Geological Survey, though formulated with great care and representing the combined views of a considerable number of oil geologists experienced in the study of the different regions of the country, are necessarily subject to revision by reason of the nature of the problem and the character of the available data. They are bound to differ from the final production, but it is unlikely that they will vary so much as 2 billions of barrels (enough to supply requirements for less than 4 years) from the truth; any difference is likely to be additional.

PROBABILITY OF QUANTITY OIL PRODUCTION IN CERTAIN AREAS INDEFINITE

Should Alaska far exceed our rough forecast, should the Permo-Carboniferous of Wyoming prove more widely productive than has been calculated, or should Utah and Colorado and western Washington disclose some surprises not compensated by corresponding disappointments in some of the other States, such an increase may be realized. Nine billions of barrels would satisfy our 1920 rate of consumption for less than 17 years. However, the chance of discovering so much available oil in the ground must not be relied on. So large a recovery by present methods is possible, but to gamble on it is dangerously hazardous and unwarranted.

[1] The leasing law of 1920 provides that companies in the control of nationals of a country excluding our companies from operating in territory in the control of that country may be excluded from operation on the public lands of the United States. This is retaliatory only.

INCREASED PRODUCTION POSSIBLE BY BENEFICIATION

It will be noted that the Survey's estimates are based on present methods of recovery. If better methods of extraction of oil from the ground can be devised, and generally employed so as to increase recovery by so much, possibly, as 50 percent, as is hoped by the United States Bureau of Mines, the supplies may approximate 10½ billion barrels, enough for 20 years, perhaps, according to the conservative estimates, or, on the basis of the possible 9 billion discussed above, 13½ billion barrels—enough, if available at once, to satisfy the wants of the United States for nearly 25 years, provided our use of oil is not increased after this year. Not to insure such an increase—and an enormous increase if oil is not too costly—would be sheer insanity. On the other hand, as I have pointed out, unless the evil day is held back by more complete extraction of oil from the ground, our domestic production will probably pass its peak in less than 4 years, and perhaps within 2; after which our oilfields will fall off, slowly at first, then rapidly, and we will depend upon imported oil, use oil-shale oil, or resort to the other alternative and go without oil.

IMPORTATIONS VERSUS EXPORTATION

For several years the United States has had to depend upon oil from other countries, principally from Mexico, to make up the deficit in our domestic production. In 1920, our importations doubled those of 1919, reaching 100 million barrels in excess of our exportations (estimated at 7½ million barrels) of crude petroleum, notwithstanding that, under the influence of oil shortage and consequent advancing prices, greater efforts than ever before were put forth during the first three-quarters of the year to increase production in this country.

Restriction of production near the close of 1920 resulted from oversupply, due to favorable production conditions, including open weather, abundant supplies, and ample railway and other transportation; to the usual winter curtailment of consumption; to special curtailment on account of industrial depression and high costs, and to overimportation. It is, however, to be borne in mind that up to the present (May 1921) the results of curtailment of domestic production are at most less than the increase of the present importation over that of a year ago. Even during the winter period of slackened consumption our domestic production capacity has been found to be far short of that actually required for our need.

UNITED STATES INCREASINGLY DEPENDENT ON FOREIGN OIL

Larger production will soon be necessary if imports or prices are not further increased. In short, the United States is dependent upon foreign oil for nearly 20 percent of its requirements, and this dependence must enormously increase in the near future. Barring again, a marked improvement in the way of more complete extraction from the ground, it cannot be many years before our wells are able to supply less than half our normal requirements, even with more effective efforts to restrict the latter. Evidently our standards of living, our industries and our prosperity must depend upon our ability to get adequate supplies either from foreign sources or from our shales. The latter we have not yet been able to treat with commercial success, and it remains to be determined at what cost satisfactorily usable oil-shale products can be made at a profit, and when they will become available even in relatively small quantities.

NATIONAL OIL CONTROL ESSENTIAL

One thing is certain: If we are to have oil for our cars and our machinery, without paying more for it than some other nation has to pay; and if our ships, which with diesel engines will have nearly three times the radius of ships burning oil under boilers, are to sail the seven seas and are to be sure of securing bunker oil at foreign ports as cheaply as ships of our trade competitors, that oil must from first to last be under the control of our own nationals. There is no room for possible doubt on that point. Only through American control of supplies sufficient to meet our needs can we expect to secure oil for our automobiles, tractors, or ships as cheaply as the country from whose nationals we will otherwise be obliged to buy it. In this way only can be we sure that oil will not be withheld from us in some time of greatest necessity. At whose mercy shall we be in time of war?

The American public does not yet fully realize the grave danger of our petroleum situation. The United States Geological Survey, which has taken the census

of our oil reserves, and the United States Bureau of Mines, have for 2 years been warning the country to prepare for the day when our oilfields will begin to fail. In fact, the main task of arousing the public has been carried by these bureaus of the Government, and by Mark L. Requa, in charge of petroleum in the late Fuel Administration. The Engineering and Mining Journal also has carried on a consistent campaign of enlightenment as to the situation for the last year and a half. The leaders of the great oil companies cannot, in general, be expected to enter a publicity campaign to the effect that the oil resources behind the capital stock of many of their companies are likely at an early date to enter permanent decline. A relatively small number, including some of the largest of our companies, have secured promising if not actually productive concessions in foreign countries, mainly in Mexico; but even the largest companies seem careful to locate near the coast or inland transportation and timid of undertaking too much development. Few, if any, have ventured across the ocean.

As yet, American oil companies have made only a beginning in the acquisition of rights for the development of oil in foreign countries commensurate with our prospective needs, and, therefore, necessary for the safety of our country. Their managers seem incapable of visualizing the nearness of our peril or the extent of the concessions necessary to guarantee our future. It is time that our oil men abandoned the fatuously complacent belief that the United States contains all she needs and ever will want, a national conceit now threatening harm to several other American mining industries.

In a juncture like the present it is deplorable that the people of the United States are constitutionally jealous of investing the Government with power such as is needed to meet our rivals evenhanded, and effectively to assist our nationals in the protection of our country.

PETROLEUM REQUIREMENTS OF UNITED STATES DOUBLE THOSE OF OTHER COUNTRIES

The total petroleum resources of the world recoverable by present mining methods are estimated by Eugene Stebinger, of the United States Geological Survey, and by myself at 60 billion barrels, about 8½ times those of the United States. On the other hand, the annual requirements of the United States are at present twice those of the rest of the world. The proportions of this disparity in consumption will probably decrease from 1921 on, by reason of rapid increase in the use of petroleum by other nations and the development of oil fields nearer to their hands. However, though our rate of increase must fall off, no permanent reduction in our total consumption is to be looked for in the near future, if oil, either imported or made from oil shale, is to be made obtainable within the purchasing power of the consumer.

The available contents of the discovered oil fields of the world, according to the estimates given in my paper on the oil resources of the world in the May 1920 issue of the Annals of the American Academy of Political and Social Science, are grouped as follows, the estimates being based on present methods of recovery:

Oil resources of discovered oil regions of the world

Country or region	*Millions of barrels*
United States and Alaska	7,000
Canada	995
Mexico	4,525
Northern South America, including Peru	5,730
Southern South America, including Bolivia	3,550
Algeria and Egypt	925
Persia and Mesopotamia	5,820
Southeast Russia, southwest Siberia, and the region of the Caucasus	5,830
Rumania, Galicia, and Western Europe	1,135
Northern Russia and Saghalien	925
Japan and Formosa	1,235
China	1,375
India	995
East Indies	3,015
Total	43,055
Total Eastern Hemisphere	21,255
Total Western Hemisphere	21,800
Total north of Equator	36,400
Total south of Equator	6,655

To the estimated oil resources (43 billion barrels) in the discovered oil regions are to be added 17 billion barrels, which, on geologic evidence, I have estimated to be present in areas where oil has not yet actually been discovered. The total, 60 billion barrels, is conservative and almost certain to be exceeded eventually—possibly by 15 billions of barrels. The most accurate calculation is that for the United States, for which the data are by far most nearly adequate. The estimate for our own country includes oil from undiscovered regions as well as that from known fields.

In my paper, mentioned above, also are briefly summarized the conditions of political control adversely affecting the privilege of American participation in the development of the oil resources of other countries, which give rise to the following conclusions:

As the case now stands, our nationals are either distinctly or in effect shut out of the regions containing nearly one-half of the oil in sight in the rest of the world if the open-door policy is not assured in the mandatory countries. Further, if to the petroleum resources in the countries now held by Great Britain, France, and the Netherlands, there be added the concessions held by their nationals in producing or prospective oil regions of other countries, the total oil resources in the control of these nations will probably exceed three-fourths of the world's oil reserves outside of the United States. An open-door policy, in the mandatory countries, at least, is an economic necessity to the United States.

The legislative restrictive regulations and policies of these countries are more fully presented in a report by the Secretary of State, May 14, 1920, to the President, and published as Senate Document No. 272.

To the above quotation I may be excused for adding another paragraph:

Behind the curtain of secret diplomacy, the rich oil reserves of the unappropriated mandatories of the Near East and of the Caucasus-Transcaspian regions are stakes of a great game during which more than one political boundary is likely to be adjusted to meet the oil ambitions of a prospective protector, while in portions of Latin America the stresses of commercial and political diplomacy are fully exerted to the disadvantage of our nationals. Even during the long war, oil geologists in the employ of the French, the British, and the organically allied Dutch Shell interests have been examining the most remote lands, including some of the unstable countries, and in certain regions have carried on their search at the very heels of the armies. According to recent British oil news, the division of the Mesopotamian oil regions between the French and British has been agreed up, and an understanding formulated in accordance with which Great Britain and her European allies will control the oil resources of the Mediterranean region.

The statement quoted above was written in February 1920, before the San Remo agreement dividing the rich petroleum resources of Mesopotamia and Syria—75 percent British and 25 percent French—with the joint arrangement for the aggressive acquisition, with government aid, of oil territory in Russia, Rumania, and other parts of Europe, was known in America, though probably long after it had actually been signed. There is no sign of an open-door policy in this; no reciprocity or equality of opportunity for the United States. As a Washington editor writes: "Moral obligations are soluble in oil." British fair play seems to have been lost sight of and British sportsmanship to have broken down.

PETROLEUM SITUATION IN THE FAR EAST

In this connection it is pertinent to recall the remarkable situation in the Far East. The German domains in Africa, and, for the most part, in the East Indies and Polynesia, having been scheduled by secret treaty for allocation to the British and French spheres of influence, there was little German territory outside the German islands of the Pacific north of the Equator left to give to the Japanese. Accordingly, the surrender by China to Japan of certain of her sovereign diplomatic, financial, and military rights under the terms of the "22 (?) articles" forced on China by Japan in 1915, and Japan's aggressions on the territory of China, one of our allies, appear to have been tacitly sanctioned—"league-alized," as it were—and Japan left to proceed according to her ambitions and her conscience in acquiring territory and resources belonging to the Chinese and the Russians. Digressing a moment, it may be remarked that the interests of two of the allies, China, in an important way, and the United States, in a very subordinate way, seem to have been sacrified to a third ally. No account is taken of Russia. Japan, whose oil reserves are quite limited, has since "occupied" Russian Saghalien (Sakhalin), with its

stores of high-grade coal and its 200-mile belt of tempting oil, gas, and asphalt seeps, until a permanent government is established and the prospective interests of Japan, including other oil territory in eastern Siberia, are recognized and assured. Oil territory under Japanese control is not likely to be open to development by the oil companies of the United States.

Within the last year, representatives of British interrelated oil interests, some of which are in part directly underwritten by the British Government, have been making examinations in Siberia, in Mexico, in Colombia, in Peru, in Bolivia, and in other countries in South America, and in the United States; have been gathering in German and other concessions in the Rumanian, Galician, and Russian fields; spreading their holdings of prospective oil territory in the East Indies, and, in general, proceeding with feverish energy with the British plans for a world domination in oil more complete and arbitrary than that which is now slipping away from the United States. In these plans the open door of opportunity seems to play no part such as it has played during the world domination by our country. It is rumored, also that arrangements are now nearly if not quite completed whereby the British will secure an oil concession covering the entire Province of Kan-Su, which from the oil standpoint now appears to be second best, if not the best, prospective great oil region in China. The oil resources of Shensi are said to be in Japanese control, and the grasp of the British is stronger in Szechuen, the remaining of the great prospective oil regions of China. If we are to have oil bunker stations for our merchant marine and our Navy, along the avenues of world trade, from which oil may be obtained as cheaply for our ships as for the ships of any other nation, where is this oil to come from?

Referring to the Stebinger map, published in my above-cited paper to show the open and closed countries and the geographical distribution of the estimated oil reserves, it now would seem that to the countries closed to American oil companies, according to present policies of Great Britain, France, Japan, and The Netherlands, may be added the Dutch East Indies, Saghalien, and possibly Mesopotamia (British claim based on a concession never granted by the Turkish Government), Syria, the northern strip of Persia, and Arabia; and it remains to be seen whether American companies will hold oil concessions of value in mandatory German territories in Africa or other regions of the world. The exclusive monopoly of oil development in mandatory New Guinea was promptly granted by Australia, which holds the mandate, to the Anglo-Persian Oil Co., in which the British Government owns a controlling interest.

A concession, or perhaps several selections, from cull territory in Mesopotamia or some other country, eventually offered American oil companies, after the prospective oil regions have been examined and all the promising areas covered by the nationals of more favored nations, might technically figure as an open door, but such belated opening, at best without evenly competitive conditions of operation, will assure little oil for America.

It is common knowledge that our principal allies, now our commercial rivals and trade competitors, have, by secret agreements, by diplomatic camouflage, and by direct action, shown a purpose to close to us the open door of equal opportunity in the mandatory as well as in other countries under their influence, and to hasten the day when we may be dependent on them for oil. *Neither in recent history, nor in the present outlook, is there any foundation warranting the United States in leaving her future as to oil not only to foreign supplies, as she surely must, except as she may perhaps be saved by oil shale, but also to oil mined, prepared, transported, and marketed by companies in the control of a nation not only competitive but commercially antagonistic.*

Oil is essential to our work, to our daily living, and to our protection. In the day of our disadvantage and dependence can we expect fairer treatment than we are receiving now?

Petroleum in Bolivia[1]

(By Arthur H. Redfield)

Two districts of interest as possible producers of petroleum are recognizable in Bolivia: The Chaco or Yacuiba district, in the southeast of the country, comprises a strip 300 miles long and 50 miles wide along the eastern foothills of the Andes, between latitudes 22° S., and 17° 45′ S., or between the towns of Yacuiba,

[1] U. S. Geological Survey, Section of Foreign Mineral Resources.

on the Argentine frontier, and Santa Cruz de la Sierra. It includes portions of the departments of Tarija, Chuquisaca, and Santa Cruz. This is the district of greater promise. The other, of less interest, known as the Pacajes district, lies in the northwestern part of Bolivia, in the Department of La Paz, comprising chiefly a limited area (so far as reported) around Chulluncayani, in the southwest of that department, 16 miles from the Arica-La Paz railroad.

The occurrence of oil both in the Chaco and the Pacajes districts of Bolivia is connected with the same petroliferous formation which supplies the oil indications of the Salta-Jujuy district of Argentina. This formation has been in recent years assigned to the Cretaceous, with its latest member extending perhaps into the Early Tertiary. The lack of fossils makes its correlation uncertain; earlier geologists have ascribed it to a variety of periods, from the Silurian to the Tertiary.

The petroliferous formation is folded along a north-south line, parallel with the Cordillera, into anticlines and synclines. Recognized anticlines are observed at the Quebrada de Peima, at the Quebrada de Cuarazuti, and at the Quebrada de Machareti.

Seeps of oil, often of high grade, are the outstanding evidence of the petroliferous character of southeastern Bolivia. Such seepages are found at the Loma de Spaguazu, the Quebrada de Peima, Quebrada de Cuarazuti, Quebrada de Machareti, Quebrada de Itacua, and at numerous other points between Yacuiba and Santa Cruz. Oil seeps occur also at Chulluncayani, in the Pacajes district.

The Chaco oil fields have been known since 1868, and several observers visited the region prior to the World War. In 1913 a British engineer surveyed the region from Machareti to Buenavista for an English company. A well drilled by the company near Cuevo found oil at a shallow depth. The work stopped suddenly in 1914. In 1915 an American engineer prospected the Yacuiba district, and reported unfavorably on it in view of the difficulties of development and transportation.

The Sindicato Petrolifero del Oriente Boliviano was formed in 1916 by a group of German and Chilean nitrate producers who desired to solve the fuel problem for the nitrate refineries. The field was prospected a railroad to Potosé was planned; and even a pipeline over the Cordillera to Antofagasta and Iquique was considered. No active development took place, however. In the Pacajes district, the company Montes y Zupan was reported in 1915 to be drilling on the Copacabana claim. No reports of the outcome of its venture have been made public.

There are no exclusive or monopolistic concessions in Bolivia covering large tracts of land. Prospecting on public land is free, the prospector being required merely to notify the authorities. Claims (called "concessions"), to the extent of 30 areas of 100 hectares each, may be taken out by any individual, citizen or alien, by complying with the necessary formalities. A large number of such claims have been taken out by individuals who are holding them for speculative purposes.

The mining laws make no distinction between the rights of citizens and of aliens to prospect or to acquire land for mining and development. A measure passed early in 1920 taxes the net earnings of mining companies. The purpose of this bill appears to be purely fiscal, to make up for the shortage of revenue.

[From Mechanical Engineering of September 1922]

THE OIL SUPPLY OF THE WORLD—ESTIMATES OF THE OIL RESOURCES OF THE VARIOUS REGIONS OF THE EARTH—THE ECONOMIC FUTURE AS TO OIL IN THE UNITED STATES—MEASURES TO BE TAKEN IN ORDER TO INCREASE AND CONSERVE THE DOMESTIC SUPPLY

(By David White,[1] Washington, D. C.)

The question is asked, Why is the United States, whose market is now suffering from a slight excess of oil supply, especially concerned about how much oil there is in our own country and the world? Are we trying to corner the world's oil? Do we fear harmful competition from countries more richly supplied? Are we running short of oil, or is there oil famine in other parts of the world that threatens to draw too heavily on our supplies in competition with our own people, with consequent raise of oil prices to levels harmful to the consumers of this

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country? The concern of the public in the economic problem of oil supplies arises from the following outstanding features of the situation, which give the question an incisive significance to every American user of oil.

To date the United States has furnished nearly two-thirds of all the oil yet taken from the ground in the world—5.5 billions of barrels out of a total of 8.5 billions. Our American fields are now pouring out 62 percent of the world's annual supply, while our country is using over 75 percent of that total supply. In other words, the United States requires over 115 million barrels more than it produces; for, whereas our output now approximates 470 millions yearly, our requirements, even during the business stagnation of 1921, called for 525 millions. Our autovehicle program, already passing 10 million cars, is still growing; our merchant ships must burn oil to compete with those of other nations; there are bound to be more tractors and trucks, pumps, small machinery and miscellaneous equipment; and air service is destined to become an everyday necessity. Everywhere, except perhaps in the Navy, the demand for even more oil is in evident prospect. Nothing can check the increase more than momentarily, except high prices due to scarcity of oil or high costs of production or importation—that is, the greater expense of obtaining the oil.

Where will the oil to satisfy these requirements come from year after year, and how long can we keep up the pace? These are plain, commonsense business questions, predicted on our present oil requirements as an established fact and on the suggested possibility that our prodigal spending of our petroleum heritage may cause its too rapid depletion if not its early exhaustion in the midst of our spendthrift career, and at some untoward moment send us as beggars to foreign countries for the precious fluid necessary not only to satisfy our extravagant habits, but even to sustain our industrial prosperity, our standards of living, and our civilization.

Obviously there is only one first thing to be done, and that is for the Nation to proceed in the Nation's business just as the businessman proceeds under similar conditions in his private business, namely, to take account of stock, to find out how much oil there is left in the United States and then to learn as nearly as possible how much oil there is in the rest of the world and where the principal deposits or reserves are located, due consideration being given to probable availability and conditions of production of these reserves.

No apology, therefore, is needed for the searching appraisal and careful estimate recently made of the oil reserves remaining in the ground recoverable by present methods in the United States, nor for its publication for the information and advice of the industry and the country at large. The justification of the formulation of estimates of the oil reserves in other countries, based upon long and painstaking studies of the available data relating to the oil reserves and relative oil possibilities of those other regions of the world, is evident. Such information is indispensably requisite for understanding the present economic situation.

KNOWN OIL RESOURCES OF THE WORLD

The oil reserves to be found in the regions of the earth where oil has already been proved to exist in commercial amounts were in 1920 estimated by Eugene Stebinger and the author at 43 billions of barrels, as listed in table 1.

TABLE 1.—*Oil resources of regions of the world known to contain commercial deposits, as estimated by Eugene Stebinger and David White*

County or region	*Millions of barrels*
United States and Alaska	7,000
Canada	995
Mexico	4,525
Northern South America, including Peru	5,730
Southern South America, including Bolivia	3,550
Algeria and Egypt	925
Persia and Mesopotamia	5,820
Southeast Russia, southwest Siberia, and the regio nof the Caucasus	5,830
Rumania, Galicia, and Western Europe	1,135
Northern Russia and Sakhalin	925
Japan and Formosa	1,235
China	1,375
India	995
East Indies	3,015
Total	43,055

This calculation is based upon a review of the available data as to the regional geology, the structure, the character and composition, thickness, relations, and alteration of the sedimentary deposits of the different basins, the formation as to local and minor folding, and as to surface indications of oil, and finally the records as to developmental tests or actual production. The consideration of the geology of other regions in which oil has not yet been proved to be present in commercial amounts led to the formulation of an additional estimate of 17 million barrels for these regions, placing the total estimate for the world's oil reserves in the ground and recoverable by present methods at 60 billions of barrels. As stated at time of publication, these estimates are necessarily highly speculative and, in spite of the care and study given to their preparation, are subject to great range of error, especially with reference to nonproducing countries and to those concerning which the geologic information is meager. They are avowedly conservative. From data subsequently reviewed and on consideration of further information in hand, the author is disposed to regard the estimates for eastern Siberia, Sakhalin, India, Assyria, and Arabia as much too low, with the probability that the oil content of South America will exceed 13 billions of barrels. He accordingly believes that an estimate of 70 billion barrels for the world's total resources is conservative.

The most important oil regions outside of the United States are believed to be located in Mexico, Venezuela, Colombia, Bolivia, Argentina, Russia, Mesopotamia (together with western Persia), Assyria and Arabia, the East Indies, China and eastern Siberia (including northern Sakhalin), the Japanese Empire, India, and probably northern Africa. A forecast as to the proportions of light and heavy oils in these great regions would be extra hazardous, but a review of the results of exploration, combined with the consideration of the regional geology, the character of the formations and the stages of alteration, tends to confirm the very natural assumption that the production of all of these regions will include moderately light, and in some regions very light, oils as well as in nearly all cases, fuel oils.

A review of the map compiled by Mr. Stebinger and used in numerous discussions, including the author's paper in the Annals of the American Academy of Political and Social Science for May 1920, indicates a concentration of the world's oil resources in the northern subtemperate and tropical regions of the earth. Many of the great reserves are distributed along the North Pacific border, the region of the Indian Ocean, and the Western Atlantic. Most of them are easily tributary to the principal routes of maritime world trade. It is likely that further investigation will show considerable reserves not only in North Africa, but along the west African coast and in Brazil—in other words, on the borders of the South Atlantic.

Concerning the restrictions by which the nationals of the United States are excluded from free participation in the development of the oil deposits of a large part of the world, and in the Eastern Hemisphere especially, to which the author has given some attention, authentic information will be found in two statements prepared by the Department of State.[2] Most American readers are aware of the efforts of our Government to secure entry for American oil companies in Mesopotamia and again in Djambi, which represents the Dutch East Indies. A satisfactory compilation of concessionary as well as political control of the oil resources outside of North America is at present nearly impossible, but it appears practically certain that two-thirds of the world's oil reserves outside of the United States are not open to development by American companies. In some countries the open door is not so open as it appears to be. Some of these reserves may in time of peace be available, if needed, to our citizens at a price, but priority of right, if not permanent reservation, will be given to the navies and militaries of the different countries. Undoubtedly whenever our citizens become dependent for oil on foreign reserves in the hands of rival nationals, they will restore with ample interest all the profits enjoyed through many years by the American exporter. Any protection that we may then need should be assured in advance.

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[2] Restrictions on American Petroleum Prospectors in Certain Foreign Countries. Message from the President of the United States, May 17, 1920. S. Doc. 272, 66th Cong., 2d sess.
Restrictions on American Petroleum Prospectors in Certain Foreign Countries. Message from the President of the United States, May 16, 1921. S. Doc. 11, 67th Cong., 1st sess.
Oil Prospecting in Foreign Countries. Message from the President of the United States, June 13, 1921. S. Doc. 39, 67th Cong., 1st sess.

OIL RESOURCES OF THE UNITED STATES THAT ARE RECOVERABLE BY PRESENT METHODS OF EXPLOITATION

Having considered the wealth of oil in foreign countries which, according to the very conservative calculations given above, is sufficient to meet the present rate of consumption requirements of the aggregate countries outside of the United States for 215 years, we come to the important question as to the sufficiency of the oil deposits of our own country to meet the whole or a considerable part of our own requirements for the future. In other words, what is the economic future as to oil in the United States? Are our supplies ample and shall we be independent, continuing our role as the world's great producer and distributor of petroleum and its products; or are our reserve so rapidly becoming exhausted that we are in the way to become a mendicant for oil among the nations which we have served with such prodigal generosity?

To answer this question, an appraisal of the domestic oil resources in the ground recoverable by present methods of exploitation has just been completed. Taking advantage of the great expansion of oilfield exploration in the United States in the last few years, the results of widespread wildcatting in regions of merely possible as well as probable territory, the proving of entire oilfields as well as pools, the training of hundreds of geologists and engineers specialized in the problems of the geologic occurrence of petroleum, and desiring to apply the best methods as well as the experience developed through oilfield examination and estimation in appraisal or depletion, in accordance with the requirements of existing tax laws, the United States Geological Survey, a year ago, invited the American Association of Petroleum Geologists to appoint from its membership representatives to serve with the oil geologists of the Survey in a joint committee for the estimation of the oil resources of the United States. With the joint committee thus promptly formed, there worked in heartiest cooperation, through subcommittees covering different areas or States, or in direct collaboration, a large number of State geologists, consulting specialists and company geologists especially familiar with the stratigraphy, structure, and mode of occurrence of oil in the different fields. After 9 months of compilation, study and discussion, the estimates were reviewed and revised in joint conference, and in January of this year were made public by the Director of the Geological Survey as given in table 2.

TABLE 2.—*Estimated oil reserves of the United States by States or regions*

	Millions of barrels
New York	100
Pennsylvania	260
West Virginia	200
Ohio	190
Indiana and Michigan	70
Illinois	440
Kentucky, Tennessee, northern Alabama, and northeastern Mississippi	175
Missouri, Iowa, North Dakota, Wisconsin, and Minnesota	40
Kansas	425
Oklahoma	1,340
Northern Louisiana and Arkansas	525
Texas, except gulf coast	670
Gulf coast, Texas and Louisiana	2,100
Colorado, New Mexico, and Arizona	50
Wyoming	525
Montana, Nebraska, and South Dakota	100
Utah, Nevada, Oregon, Washington, and Idaho	80
California	1,850
Eastern Gulf Coastal Plain and Atlantic Coast States	10
Total	9,150

These estimates are, naturally, most accurate in those parts relating to proved territory, for which data invaluable for such calculations are now available. In that part relating to probable territory they represent the balanced judgment of a group of chosen specialists including geologists particularly familiar with the regions and their history. The greatest errors may fall in those portions of the total which relate to merely possible territory, especially in regions and

States in which oil has never yet been proved to be present in commercial amounts. As stated by the author in a discussion of the subject at the New York meeting of the American Institute of Mining and Metallurgical Engineers, in February, the errors of excess in the estimates for disappointing regions are likely, on the whole, to be balanced by the deficiencies in others.

It may be of interest to engineers, who represent the great oil-consuming industries, to note that of the 9 billion barrels which, as of March 15, 1922, should remain in the ground recoverable by present methods, rather more than 4 billion barrels belong to the heavy group containing the fuel oils. Of the class containing the lighter oils about 725 million barrels are believed to remain in the Appalachian States, and 40 million barrels in the Lima-Indiana region. The fuel oils are largely to be found in the Pacific coast, the Rocky Mountain and the Gulf States.

ECONOMIC SITUATION OF OIL AS IT AFFECTS THE UNITED STATES

In the United States we have at the present moment produced a total of 5½ billion barrels of oil. We have therefore used up more than one-third of our estimated original heritage of oil. In 1921, a year of stagnation of American oil production, we drew out nearly 470 million—practically half a billion—barrels of oil from our reserves, which are now calculated at 9 billion barrels. Contrasted with our more than 5 percent rate of annual depletion, the rest of the world withdrew in 1921 not much over 280 million from its store of over 60 billion barrels, or less than one-half of 1 percent of its reserves recoverable by present methods. In other words, the reserves of the rest of the world would stand the present rate of drain for over two centures. From the standpoint of world distribution of oil and the relations of our reserves to those of the rest of the world, an error of 2 or 3 billion barrels—4 to 6 years' supply—in the committee's estimates of the oil reserves of the United States is comparatively insignificant.

The cooperative committee expressly affirms—and it is well known in the profession—that not all the oil pools in the United States will have been discovered a generation hence. On the other hand, the committee takes great care to point out that while our reserves would not meet our present rate of consumption demands for 20 years, if they could be taken out of the ground fast and cheaply enough to supply our market (a conditioning clause that has generally been lost sight of by the press and the public), this country will be producing oil for as long as 75 years to come.

Since oil cannot so rapidly be located and taken from the ground, it follows with certainty that, according to the laws of oil production, the annual oil output of the United States must at an early date pass its peak and enter upon a long-drawn-out period of general though fluctuating decline to ultimate exhaustion, except so far as fields in great numbers may be rejuvenated by better methods of mining. Opinions differ as to how soon the production peak will be passed; but most geologists believe that within a few years, perhaps less than five, we shall in the normal course enter on a period of waning fields in increasing number, with discoveries more infrequent and in general more costly. The date of passage of the peak depends largely on the demand for oil and the reflected oil prices. If supplies from foreign sources continue adequate and cheap for a long time the passage of the peak may be insensible though early; but should they be seriously curtailed or largely cut off for a considerable period in the near future, we probably shall then see our operators driven by high prices to the greatest maximum, in which an overoptimistic industry will eventually have found it has passed the peak.

A large portion of the public does not yet fully recognize that the United States is already dependent upon foreign oil to meet its still-growing requirements. Our oil importations which were 18 million barrels in 1913, grew to 38 million in 1918, 53 million in 1919, 106 million in 1920, and 125 million in 1921. A small part only (9 million barrels) of this amount is offset by exportation of crude petroleum from the United States. In short, in a period of industrial depression we have imported one-fourth as much as we produced. Nearly all of this oil comes from Mexico, and that is why Americans are so profoundly interested in Mexican oil.

The present production in Mexico, amounting to about 195 million barrels in 1921, is mostly drawn from a relatively small number of wells located along a single axis of folding in which a thick limestone, the Tamosopo, is caverned by solution and, in the structurally high points, gorged with gas and oil under most

tremendous pressure of salt water. No wells of such enormous production are known in any other part of the world. It is common knowledge that most of these wells have gone or are now going to salt water, and on the basis of this fact as differentially interpreted in the light of other geologic conditions in the field, it is believed by many oil geologists, including some of high repute, that the greater part of Mexico's present phenomenal production is on the verge of approximate extinction. It is practically certain that, while some new discoveries of Tamosopo oil may come to the aid of the rapidly failing pools, sooner or later the production of oil from the world recordbreaking Tamoposo limestone gushers will wane, and the remaining portion of Mexico's 4 to 5 billion barrels of oil reserves, as estimated, must be won by the sweat of the oil operator's brow from wells of the ordinary type. The magnitude of the task of developing enough oil fields of the common or garden variety in Mexico to take over the load of an annual production of 195 million barrels which was produced from less than 300 wells in 1921, may be inferred from the fact that in 1908, when for the first time the production of oil in the United States amounted to so much as 175 million barrels, over 140,000 wells contributed to the output. This number is, of course, subject to sweeping and radical discount for rapidity of development and freshness of production. It would take over 10 Haynesvilles or a group of 4 Mexias or 14 Salt Creeks, all running full blast, simultaneously, and all continuously maintaining their January rates of production, which, of course, is impossible. It is difficult to estimate the oil-price stimulus necessary to develop a production of 200 million barrels of oil in Mexico from wells of the ordinary type under existing transportation, climatic, and industrial conditions within 5 years. The prices requisite would certainly be most encouraging for the production of oil from shale in this country.

The collapse, or better, the great slump, in Mexican production, which seems sooner or later inevitable, can hardly fail to react on our own oilfield production, probably driving it to the limit; and it is likely that in the early period of this strain the annual output of petroleum in the United States will pass its peak. Beyond this point our need for more foreign oil is likely to spring up from our decreasing domestic production more than from further growth of our consumption requirements. In this period relief must come from other foreign oilfields and from the production, by distillation, of shale oil, on whose adequacy and on whose yet undetermined cost we may be obliged to rely for protection against transoceanic importations at transoceanic prices beyind our control. Too great an advance in price will, of course, check our use of oil and bring it within the bounds of practically available supplies from all sources, at prices then viewed as practicable. The oil we cannot afford to buy we will do without.

The extent to which failure of Mexican production may be disastrous to this country depends on the completeness of the slump. It depends also, especially in the early stages, on the extent to which the American oil companies have developed or can rapidly develop considerable available production in other foreign regions on the one hand, and, on the other hand, on the extent to which, as the results of scientific research and energetic commercial application, better methods of oil mining are developed and proportions of the oil not recoverable by present methods of extraction are then taken for the ground. As is well known, in most fields and sands the larger portion of the oil remains locked up in the pores of the reservoir sands, even when the fields are played out and abandoned. It is believed by engineers who have given most study and experimentation to the subject that an additional recovery of 40 to 80 percent over that obtained by present methods will ultimately be possible in many of the fields.

ECONOMIC DEDUCTIONS

Around the constructive economic deductions to be drawn from a review even so superficial and elementary as this summary of the high points of the situation as to oil resources, it is to be seen that—

1. The need of foreign oil reserves available for continued use in the United States is obvious.

2. Waste in producing, in transporting, and in using oil should be prevented or curtailed as far as is economically practicable.

3. Increased concentration of thought and experimentation on the more efficient use of the oil now available and on the production of commodities of greater efficiency are economically urgent. On every occasion consideration should be given to the general abandonment of oil to generate steam, in favor of the three-times-as-efficient diesel motor or some other still more effective substitute.

4. More intense and more widespread researches in the production of liquid hydrocarbons through processes—so-called low-temperature carbonization—aimed at the more efficient use and the wider adaption of our bituminous and lower rank coals are important.

5. The development on a commercial scale of an oil-shale industry deserves earnest and wise consideration. Naturally there will be waste and loss of this shale through mining first the richest beds, just as takes place in our coalfields. As has been pointed out by Requa and others, the production of oil from oil shales is a matter of mining and retorting ton by ton and predicates the gradual building up of an industry which, to replace one-third of our present petroleum output, would require men, cities, mining plants, machinery, transportation, water, etc., roughly equal to one-third of our butuminous-coal-mining industry. It is a gigantic task requiring years and enormous capital. Above all it requires planning through research, through experimentation, and through patient trial on a commercial scale, with the closest attention by engineers of all kinds to costs as well as products, with the object of placing the industry on a successful basis as a going concern as soon as prices of crude petroleum and conditions as to prospective supplies permit. Studies should be made to show what prices for crudes of different grades will justify the systematic development, in different regions, of oil-shale production. Shale oil, by which is meant artificial petroleum obtained by distillation of oil shale, may be looked forward to as a stabilizer of domestic prices as well as an economic backstop in oil. Eventually, and especially as foreign supplies available to the United States becomes scarcer or too costly, it should guarantee our ultimate independence in oil, and, to this extent, our industrial and social prosperity as well.

6. The recovery of a much larger portion of the oil in the reservoir rocks than is obtained by present methods is an imperative necessity, demanding the faithful, the intelligent, and the immediate consideration of the States and of the Government, as well as of the oil industry.

The Commission states that:

"The main objectives of long-range policy must be to encourage maximum economic discovery and recovery of the Nation's natural-gas resources; derive the greatest economic advantage from these resources while they last; and minimize the costs and dislocations of the eventual shift from natural gas to other forms of energy.

"The steps that should be taken to encourage maximum discovery and economic recovery of natural gas are closely linked with the problems of seeking to maximize the Nation's economic advantages from its natural-gas resources. The key questions are:

"How can the Nation get the greatest use from gas in lifting oil so as to get maximum economic recovery of petroleum resources?

"How can it minimize economically the physical waste of gas in flaring?

"How can it minimize inferior uses of gas for which more abundant energy resources, notably coal, would serve as well—and, in the long run, at lower real cost to the Nation—in order to maximize special advantage uses in which gas serves its highest economic function in the long run?

"How can it avoid severe dislocation and heavy capital costs in transferring nearby and distant consumers to other fuels, and in abandoning pipelines, when the supply of natural gas turns downhill?

"The major job of bringing about adjustments in accord with national policy must be carried by the same private industries that were responsible for the sensational growth of the gas-fuel industry. Strong market forces already are encouraging desirable adjustments which Government must help to guide and accelerate.

"The Commission nevertheless is convinced that there is substantial room for further progress toward conservation on public and private lands alike, particularly in older fields, and that no time should be lost in taking advantage of every such opportunity to strengthen the Nation's long-range-energy position. In curtailing flaring, encouraging unit operation and the like, heavy weight should be given by both private producers and Government administrators to the prospects that improved market and technological conditions may later pay off in situations where increased conservation now appears uneconomic.

"Industry and Government experts agree that natural gas consumption should be shifted as rapidly and fully as possible toward special advantage uses. Some observers believe that Government should impose direct curbs on economically inferior uses of natural gas.

"The Commission strongly doubts the efficacy of meeting the problem by detailed regulation. Other reasons aside, there appears no economic basis for designing curbs which would be any more suitable and valid than the normal pressures of price relationships.

"Eventually, less economic uses of natural gas will be squeezed out by unfavorable prices. The aim of private industry and Government alike should be to achieve this as rapidly as feasible, taking into account the problems of pipeline operators and of consumers and other long-run as well as immediate economic considerations."

It is gratifying that the Commission recognizes that "there appears no economic basis for designing curbs which would be any more suitable and valid than the normal pressures of price relationships."

Certainly, those in the natural gas industry are aware of the problems set forth by the Commission and if we place our faith in the normal pressure of price relationships, we will solve most of our problems without the intervention of curbs and compulsion. It is regrettable that the Commission does not depend on the pressure of price relationships more generally.

CHAPTER XIX. COAL—CAN COSTS BE CUT?

Coal is our greatest long-term energy resource. The Commission states:

"The big problem of coal is how to put the vast reserves to greater use at lower costs. Reserves of coal and lower-quality solid fuels are more than 90 percent of the Nation's total mineral fuel reserves and about 40 percent of the world's total coal reserves. Only about 2½ percent of recoverable United States reserves have been mined to date. Reserves of coking coal are less favorable; they represent 2 percent of total United States reserves but support 15 to 20 percent of annual coal production."

The coal industry, unlike the petroleum industry, has not been a big-company industry. The lack of large companies has hampered the coal industry in carrying on a constructive research program. The Commission states:

"* * * the coal industry is at a disadvantage because, with few exceptions, it is made up of small companies that are financially unable to invest heavily in research and development. In 1951 private industry and Government together spent less than $1 on coal research for every $5 spent on petroleum research."

This is an important factor in evaluating the contribution of big business in general. The major companies in other industries, such as petroleum, have carried on research which has been lacking in the case of coal.

The Commission suggests the possibilities of additional research by the Bureau of Mines which may be justified as the industry has not been able to carry out such programs in the past by itself. The Commission states:

"In the Commission's view, the experimental work of the Bureau of Mines in underground gasification merits strong and continuing support. Improvements in aboveground methods of coal gasification should likewise be sought for reasons discussed in the previous chapter on natural gas.

"Though the promise is great for major improvement in use of the Nation's rich coal reserves, three main steps must be taken to bring this about: (*a*) Much greater effort to advance the technology of coal production, transportation, and use; (*b*) large-scale investment in widespread application of new methods, accompanied by closer cooperation between the coal industry and major coal users; and (*c*) more stable management-labor relations to insure continuity of supply to customers.

"Government can help on all three scores but the main burden on the job should be carried by private industry and labor.

"The Commission recommends that the Federal Government, acting through the Bureau of Mines, undertake, with the cooperation of private industry, labor, and private research organizations, a thorough appraisal of present research and development work relating to coal, and the formulation of a strong program to advance coal technology to be carried out by a combination of private and public effort. In light of the needs revealed by this proposed study, ample funds should be provided by Congress to carry out the Government's share of a comprehensive coal research and development program, with provision for using such funds in part for contracting to non-Government research organizations.

"Beyond this, Government policies and programs which affect the coal and coal-using industries, directly or indirectly, should be reexamined to insure that they are uniformly directed toward advancing coal technology, large-scale investment in the application of such technology, and the broadening of markets for coal on a solid economic footing.

"In the Commission's opinion, this positive approach to putting the Nation's coal resources more fully to work through aggressive improvements in productivity and use is the only pattern that can be followed in the light of the expansion of the economy that will have to be sustained. The negative approach which seeks to cure the coal industry's past ills by imposing artificial restrictions upon competing fuels is unacceptable."

CHAPTER XX. ELECTRICITY—HOW MUCH AT WHAT COST?

This chapter reviews the development of central-station electric power in the United States and suggests possible future trends. The Commission states:

"So far, the trends of real costs and real prices for electricity have been downward. From 1925 to 1950, the avarage price of electricity to residential consumers, corrected for changes in the purchasing power of the dollar, fell 70 percent. Prices paid by industrial consumers likewise declined sharply. This reflected improved technology, the economies of larger scale generation and purchases and other cost-reducing factors.

"Private industry produces 85 percent of the Nation's electric-energy supply (70 percent by private utilities and 15 percent by industrial concerns) and has been responsible for most technical advances during its 70 years of growth."

Those who advocate public power as a useful "yardstick" for measuring the performance of private industry should examine the above statement by the Commission. The Commission states:

"The central problem of electric energy is how to increase the Nation's supply 2½ times during the next 25 years without running into considerable higher costs per unit. The main focus of this report, therefore, is upon the job which Government and industry must jointly understake: (*a*) to expand generating and distribution capacity at a rate rapid enough to meet the growing electric-energy demands of consumers in all areas of the Nation; (*b*) to hold the real costs of electricity down to the lowest level, and (*c*) to meet the electric energy needs of national security.

"During the 1930's, Congress acted to extend the Federal Government's influence and activities in the electric field to accomplish three main objectives:

"Extending electric services to more consumers, particularly in rural areas not adequately served by private utilities.

"Developing selected large-scale water resources where private development did not appear feasible, partly because of the huge investment but especially because maximum public benefits sometimes required coordinated multipurpose development of an entire river basin. In such cases the primary purpose—with variation of emphasis from one project to another—was to obtain low-cost electric supply, flood control, navigation, recreation, and irrigation benefits. With respect to hydropower, the expressed congressional purpose was also to expand the use of electricity, and beyond this, in the eyes of many, the aim was to provide a useful 'yardstick' for measuring the performance of private industry and injecting a strong and healthy element of competition.

"Correct financial abuses on the part of some utility holding company systems with the aim, among other things, of encouraging further regional integration of generating and distribution facilities.

"After years of development and controversy, these Federal policies and programs appear to be well established and the respective roles of Government and private enterprise better defined and stabilized. Although, among others, such important questions as Government's role in transmission of power and in steam generation linked with hydroprojects still remain to be clarified, Government and private industry probably will continue to share the field.

"The Commission recognizes the difficulties that remain in drawing a workable line between public and private enterprise in specific situations but accepts as a basic principle that Government and private industry both have major roles to play and that there is need for close coordination."

The Commission perhaps takes too much for granted in assuming that the public has accepted as large an area of direct public power production as envisioned by the Commission. The Commission apparently accepts the fact that the Federal Government will undertake the development of most hydroelectric sites and may build steam plants to supplement hydropower in some areas. The report makes no recommendations as to how hydropower should be transmitted from the dam site. This is the most important problem to be faced by the Congress in establishing the role of private and public power.

The Commission urges that interconnection between utility systems, both public and private, to form broad grid systems should be furthered in every way. Such interconnection will not only promote efficiency of generating capacity but is also an important security measure. The Commission's remarks on this subject are significant:

"The outbreak of war would impose a sharply increased burden upon the electric-power industry, especially in major industrial areas. Moreover, if enemy air attacks disrupted facilities in one area, it would be necessary to draw electricity from other nearby regions in order to keep industry and the local economy functioning and thus minimize the effects of the damage.

"Since construction of electrical facilities requires considerable time, the Commission believes that dangers can best be minimized by expanding generating capacity and establishing interconnecting transmission lines between systems and areas in peacetime."

In setting the goals for the future:

"The Commission concludes that action in the following six main areas by private industry and Government is important in meeting the Nation's long-range needs for supplies of electricity:

"*Incentives for private industry.*—To enable private utilities to expand and advance technology, it is obviously important that all related government policies—Federal, State, and local—should be shaped to provide conditions favorable to intensive technological research and development and to capital expansion, balanced with full protection of the consuming and investing public.

"*Cooperation between public and private units.*—The national interest in greater production at lower costs will be promoted by mutual recognition, between the Federal power agencies and private systems, of the needs of each for expansion to meet market requirements, for close integration between public and private facilities within the established principles of Federal power policy, and for strengthening joint public and private utility planning for future expansion. Protracted controversies will only contribute to power shortages and higher energy costs.

"*Integration and coordination of plants and systems.*—Remaining opportunities for improved integration and coordination of electric plants and systems everywhere, both within and between power regions, and regardless of ownership, should be exploited fully. This should apply with particular force to joint planning of new facilities. Removal of State restrictions on electric power exports and resolution of present issues concerning Federal Power Commission jurisdiction over interstate power shipments would help.

"*Development of hydroelectric sites.*—The Federal Government will have to continue its work on economic hydrosites, especially where multipurpose development of a river basin represents the best approach. There will be cases where part or all of the job can be handled by private business, particularly where a site can be developed best on a single-purpose basis, or where private industry and Government can collaborate in a multipurpose development.

"*Expansion of thermal power.*—Further steady advances are required in the technology of thermal generation and of electric transmission, along with large capital investments in thermal capacity, well timed to keep pace with the growing needs of various areas. Private enterprise is well equipped to carry the main burden, though Government can assist and supplement at various points by contributing technology and, where appropriate, constructing limited amounts of thermal capacity to operate in conjunction with Government-operated hydroelectric systems.

"*Electricity from atomic sources.*—Electricity produced from nuclear fuels is already technically feasible and may prove to be a valuable supplement to other sources of energy, particularly in regions remote from other fuel sources."

The Commission specifically recommends:

"That the Nation's hydroelectric potential be developed as fully and as rapidly as is economically feasible. Priority should be given to projects that promise to contribute most economically to meeting the energy needs of particular regions, in light of their present and prospective energy costs, supplies, and needs. Specifically, early action is important in the St. Lawrence, Niagara, and Columbia River areas, where major projects already have been planned and which are among the best sites remaining to the Nation for developing hydropower in the lower cost range."

This recommendation hinges on the resolution of the controversy over public versus private development of dam sites and the related question of who is to transmit the power.

The Commission also recomemnds:

"That the present cooperative arrangements between the Atomic Energy Commission and privately owned electric utility companies and other interested companies and groups for developing economical ways to obtain electric power from atomic sources be continued, and that the tempo of developmental work in this field be kept at the maximum level permitted by urgent seurity demands upon supplies of fissionable materials and technical personnel engaged in the atomic-energy program."

The Atomic Energy Commission has done an exceptionally good job in working with private industry and in using the resources of private contractors. Fundamental changes in the atomic-energy law are now required to permit a greater participation by private enterprise.

CHAPTER XXI. ENERGY FOR OTHER FREE NATIONS

This chapter summarizes the energy problems of the other free nations. The Commission concludes its general discussion with a summary of its position which is quoted below:

PATHWAYS TO FREE WORLD PROGRESS

"The aim of international cooperation in the energy field must be: (*a*) to push back the physical, technical, and economic boundaries of free world energy resources; (*b*) to expand energy supplies and the shipment of such supplies from surplus to deficit areas as well as energy consumption in source areas; and (*c*) to achieve those patterns of energy production and use in each area which will satisfy needs at lowest cost. Beyond this, provision must be made to meet the energy needs of a possible war when requirements would press suddenly upward and normal sources of supply would be subject to grave disruption.

"Free world energy resources, if vigorously developed and effectively employed, appear adequate to support economic growth and rising living standards in all the free nations for many years to come, though at best certain deficit areas will experience problems of energy shortages and high costs.

"Progress toward these desired results will require tremendous capital investment, the wide application of modern technologies along with technical and management skills, the training of local workers and improvement in their health and general living conditions, enlargement of transportation facilities, and, perhaps most difficult of all, the overcoming of stubborn political difficulties. These various problems, which do not apply to energy alone, are considered in chapters 11 through 15 of this report and the Commission there made recommendations designed to help in all these matters."

CHAPTER XXII. ENERGY FOR THE NATION: A SUMMARY

This chapter summarizes the energy position of the Nation. The Commission first asks these questions:

"Does the United States have the natural resources to provide enough energy for the future? Will the real costs of energy be forced upward, with possible injury to economic growth? If another world war breaks out, can the energy needs of the United States and its allies be met? Are there opportunities for strengthening this Nation's long-term energy position?"

It is able to present optimistic answers:

"Looked at as a whole the energy resources of the United States, especially if supplemented moderately by imports, seem adequate to meet expanding needs up to 1975, with little or no increase in real costs, provided full advantage is taken of the opportunities presented by the United States combination of energy resources.

"The security problem, centered on liquid fuels, remains difficult, but reserves and new sources under development plus extra refining and transport facilities should in time help meet these needs.

"These many opportunities will pay off only if the advances of technology and tremendous necessary outlays of capital are timed to meet shifting conditions and rising demands in an orderly fashion. Private business, given favorable economic conditions, appears capable of shouldering most of the burden of providing enough energy.

"Harnessing energy resources to meet expanding demand with the lowest cost combination of supplies consistent with security needs will require further large shifts in the pattern of United States energy supplies. They will be induced by the interplay of many forces—both short-range and long-term economic, geologic, and technologic factors; private and governmental decisions and policies; national and international developments and attitudes, each brought to bear on the side of supply or demand, or both, and reflected in relative costs and prices of competing sources and forms of energy. The market mechanism is the main vehicle through which these forces will have their effect; hence it is to a well functioning competitive market and a dynamic energy industry that the United States must mainly look to achieve timely and economical adjustments of the energy pattern."

The Commission again shows concern over the conversion losses in converting primary fuels to secondary forms. It says conversion losses will rise.

"The shift toward greater use of secondary forms will require a growing proportion of primary fuels to pass through a conversion process—such as petroleum refining, coking, and electric generation—before reaching the consumer. As a result the amount of energy used up in the conversion process may increase from less than 17 percent of total primary fuels in 1947 to about 20 percent of the much greater total for 1975, even after allowing for improvements in engineering efficiency. The actual amount lost may increase from 214 million tons BCE in 1947 to about 520 million by 1975 (see chart, conversion loss and its effect). Accordingly, the total demand for primary fuels will increase somewhat more than total demand at the end-use level to make up for the greater conversion losses."

This philosophy completely ignores the fact that primary fuels have only a very limited usefulness and the direct combustion of most primary fuels results in inefficient energy conversion. Certainly primary fuels could not power our automobiles, aircraft, or diesel trains. The efficiency of the diesel engine, as an example, compared to the efficiency of a steam locomotive supplies the answer as to whether there are overall losses in conversion of petroleum to gasoline, fuel oil, and the many other petroleum products. This entire approach appears fallacious and completely ignores the recovery of valuable byproducts in the processing of petroleum, which has given rise to the petrochemical industry; and to the conversion of bituminous coal to coke which for so many years has furnished the bulk of the crude materials for the organic chemical industry.

The Commission concludes this discussion of the energy problem with the proposal that another Government agency be created to solve problems which the Commission has not demonstrated requires solution through Government action. The Commission says:

"The Commission therefore concludes that the most important step for Government to take at this time toward developing a comprehensive energy policy is to achieve, through a single agency, a comprehensive and continuing review of the long-term energy outlook and an appraisal of the adequacy of public and private policies and programs for coping with the problems that such a review my reveal.

"Such a coordinating office must obviously work closely with all other Government agencies concerned with energy problems and with industrial and other private research organizations with interest in that field. Its review and appraisal must embrace a consideration of demand prospects, the availability of energy resources both foreign and domestic, and not least of all, the trend of technological developments and the specific needs to further such developments. It should report potential shortages and other oncoming problems in time for corrective action by either private industry or Government, and should recommend the measures required and who might best undertake them.

"The agency's activities relating to energy should be closely coordinated with similar efforts involving materials generally, the technology of materials, and national security."

The Commission has fallen into the accepted habit of recommending another Government agency to coordinate all the other Government agencies already in the field. The text of all the chapters dealing with energy clearly shows that if there is a minimum of Government intervientionn, private industry will get the job done and will meet the changes in the demand-supply position which are indicated by the normal workings of the price system. There will always obviously be a place for regulatory functions in the case of public utilities. The Bureau of Mines performs a valuable service for the mining industry, but no case has been made for another Government agency to coordinate all the others in the energy field which will necessitate more bureaucracy, more taxes and ultimately further legislative proposals so that the agency may perpetuate itself.

TECHNOLOGY: RESOURCE FOR THE FUTURE

CHAPTER XXIII. THE SCOPE OF TECHNOLOGY

This chapter shows how technology creates new demands for materials and solves materials problems through other technological developments. The Commission says:

"Until the Second World War the United States could afford to let its materials problems work themselves out at a leisurely pace. It took aluminum 60 years to move from a curiosity to a commanding position in the world of metals. Now, in the urgency of today's disordered world, there is less and less chance that what is casual will be adequate. Industry is primarily interested in providing products; whether or not the product relieves a problem in materials is usually incidental. Thus, industry ordinarily undertakes materials research only when hard pressed, that is, only after a crisis is already well developed. Individual companies have understandably only a limited interest in long-range research on problems whereby, if successful, they pay the bill for their competitors."

This statement is not entirely fair as it ignores the competitive efforts of material producers to invade markets.

Aluminum did not take 60 years to move from a curiosity to a commanding position in the world of metals because there was only a casual effort to further its use. On the contrary, the Alumium Co. was constantly seeking new outlets for its material which in turn necessitated development of new alloys, forming processes, and a constant reduction in costs. There was nothing casual about this development. As much can be said for any of the other materials. Nonintegrated firms look to the producers of materials to anticipate materials problems for them and to supply them with new and improved materials which they in turn can fabricate into articles with greater competitive appeal. The larger firms are certainly not casual about their future materials supplies. They are always in a position to integrate into materials production if their suppliers do not anticipate their needs.

The above statement apparently is designed to set the stage for more Government planning in the field of technology, as indicated in the paragraph which follows:

"If we are not, in the future, to have the drafts of time by which new materials can transmute themselves into new industries, we shall have to substitute something else for the slow ticking of the clock. We shall have to increase the overall effort of materials technology and plan its whole pattern of research better than it has ever been planned before."

The Commission establishes six tasks for technology. They are:

"*To foster new techniques for discovery.*—There is plenty of reason to believe that great ore bodies lie farther below the earth's surface than we have ever yet been able generally to explore.

"*To bring into use materials which so far evade our efforts.*—Industry has learned, so far, to use only a fraction of the elements and substances which surround us in the physical world. There is on reason to think that we are limited to our present familiars. Atomic energy activities are creating new needs and stimulating the search for solutions, but many prosaic substances remain only partially utilized by today's industry.

"*To apply the principle of recycling more and more broadly.*—We wring material from the earth, we use it, and after its span of life it disperses by rot, fire, or corrosion back into the earth, into the air, or into the sea. It may not again become sufficiently reconcentrated by natural forces to the point of industrial usefulness for geologic ages. Wherever we are able to shorten this cycle, we are able to use materials more intensively with less net drain on what the earth still provides.

"*To learn how to deal with low concentrations of useful materials.*—In one sense, this is the marching history of materials technology. Whereas the iron and steel industry has been accustomed to 50-percent concentrations of the element it needs, it is now becoming accustomed to concentrations half as great,

and the newer chemicals industry can extract magnesium from sea water in which its concentration is only 0.13 percent. The handling of more and more dilute concentrations seems an inevitable necessity for future technology; this should ultimately make possible the complete recycling of many materials, and thus an inexhaustible supply.

"To develop and use more economically the resources that nature can renew.—The sun yields the earth an endless bounty; the direct utilization of solar energy without the necessity for cycling it through stockpiles of fossil fuels millions of years old is perhaps the most important contribution technology can make to the solution of the materials problem. By better management of all growing things susceptible to industrial use we can convert solar energy into materials and take increasing burdens from mineral materials which cannot be made to grow.

"To lessen or eliminate the need for a scarce material by substituting a more abundant one.—We are witnessing today the substitution of aluminum for copper in electrical transmission lines. We may later witness a more complete substitution of microwaves for wires. To what extent can boron replace scarcer materials as alloying agents in the steel industry? How much further can plastics go in substituting for metals, for bone, for special woods?"

Every informed individual will accept most of these goals. They are all being practiced by the mineral producing and fabricating industries today.

CHAPTER XXIV. THE TASKS FOR TECHNOLOGY

This chapter develops the six tasks which were outlined in the preceding chapter. Much of the text, while elementary, represents a good discussion of the problem. Exception is taken to the following. Page 136 discusses a so-called sulfur shortage. The Commissions says:

"During the sulfur scare in 1950–51 a great deal of consideration was given to the reactivation of pyrites burners through which, in the days before Frasch-process sulfur, we obtained most of our supplies; to the recovery of sulfur from the 'sour gases' (hydrogen sulfide) of the petroleum industry; to pyrrhotite; to the wastes of Canada's nickel industry which produces its metal from sulfide ores. Were we to recapture and recycle even 10 percent of the sulfur that now escapes in stack gases, we would considerably postpone the day when these more elaborate measures may be necessary.

"The Commission believes that compulsion toward sulfur recovery is stronger medicine than today's imbalance warrants, but it points to the sulfur example as something which industry should not cease thinking about just because one emergency did not occur as expected."

The so-called sulfur scare arose because the Office of Price Stabilization priced our domestic low-cost sulfur well below the price of sulfur produced from pyrites. The International Materials Conference established an export quota for the United States to insure that foreign countries would have access to our sulfur at an artificial price. In order to make the sulfur available for export and thus implement the International Materials Conference quota, the National Production Authority reduced the amount of sulfur which domestic consumers could use to 90 percent of their 1950 consumption. The sulfur scare was actually the result of Government interference in the sulfur market. Had the price of sulfur been allowed to rise, there would have been no shortage and the recovery, which the Commission urges, would have been economic at the higher price of sulfur. This only goes to show that the solution lies not in compulsion, but in freedom.

Page 136 also again mentions the fact that lead is frequently used in a manner which makes it disappear.

"The lead in a scrapped storage battery finds its eventual way, to the extent of 80 percent, back into new lead production. The lead blown from the tailpipe of an automobile using lead tetraethyl in its gasoline is so dispersed as never again in a million years to be available for commercial use. The recovery of most other metals falls between these two extremes presented by different uses of the same metal lead, but in general it is a matter of considerable concern, and here the principle of recycling is most seriously neglected."

The author of the above paragraph should have read the Commission's statements on conserving for the future which have already been referred to in the review of chapter III. The Commission again shows its distrust of our market system in the following statement:

"To the scientist worrying about our continuing metals supply, our arrangements as a Nation for recycling scrap and returning it to the materials stream are appallingly negligent. One chemist, pointing out that 'when a few ounces of metal are worn from the motor and running gear (of an automobile) the machine is pronounced unfit and discarded,' has gone on to add, 'I should think the automobile manufacturer would want to lend the metal content of a car to the purchaser on a deposit basis, rather than sell it outright and rely upon the haphazard junking system to return part of it as scrap.' "

Yes, the American free-enterprise system is completely unplanned. Every day sufficient milk is delivered to any large city by countless farmers. They are mobilized by a system of free markets. There is always sufficient milk and yet very little milk goes to waste. There is no planning other than the planning by each producer to maximize his profits.

David McCord Wright has perhaps made the best commentary on the effectiveness of our unplanned society in his book Capitalism. He said:

"Just after the Second World War, so the story goes, an American officer asked a Russian officer to have dinner with him at a restaurant. The dinner

was good, and the Russian said, 'You must have had to order this weeks ahead to get so good a meal.' 'No, indeed,' said the American, 'I just walked in.' The Russian was astounded. 'How did they know,' he said, 'that anyone was coming in to order this particular meal?'

"Most of us are so accustomed to the daily miracle of production functioning apparently without a guide that we are impressed only when the system goes wrong. But from the point of view of historical perspective the Russian's attitude was the right one. The 'normal' state of mankind, if we merely take a majority vote of cultures over the known range of history, is either planned despotism or oligarchy or else unchanging primitive society governed by ironclad custom. It is only in the past 150 years of recorded history that we know of anything different continuously existing on a large scale, and if we could really take a long view, we should not be surprised that things sometimes go wrong. We should be astonished only that they ever went well."

The scrap industry in America is totally unplanned insofar as the Government is concerned, but it could hardly be called a haphazard junking system. Scrap is collected, sorted, processed, and returned to the mills. The scrap market is activated by price. Perhaps the scientist who is worrying about our continuing metals supply would like to see the redtape which would accompany the suggestion he has made. Most manufacturers have found that the so-called haphazard junking system, when unfettered by Government controls, works remarkably well.

The Commission has frequently referred to the dissipation of lead blown from the tailpipes of automobiles. It completely disregards the savings in our petroleum resources which have resulted from this use of lead.

The following is an address by Joseph A. Costello, vice president of the Ethyl Corp., delivered before the Lead Industries Association in April of 1953. It answers the Paley Commission's charges most convincingly.

(The address follows:)

The Consumer Looks at Lead

By Joseph A. Costello[1]

An examination of the broad trends in lead consumption over the past 25 years shows a steady increase in total lead demand. Without taking into account metal for the stockpile, domestic lead consumption has increased from an average just under 800,000 tons in the 1920's to over 1.1 million tons in the 1950's.

While this increase is substantial, its greatest significance lies not in the statistics themselves, but in the play of economic forces that accounts for them. Lead for batteries, lead for gasoline, lead for protection against the elements, lead as a construction material—these are only a few of the many applications that have been found for lead which have demonstrated proven economic usefulness.

THE MEANING OF TETRAETHYL LEAD

I do not feel qualified to discuss in detail the usefulness of other lead-consuming products, but I can tell you a little about what tetraethyl lead has come to mean to the national economy.

In the 30 years since it was commercially introduced, tetraethyl lead has come to be used in over 95 percent of all motor and aviation gasolines. Because of this fact, tetraethyl lead has grown to become the second largest consumer of metallic lead in the country.

There was a reason for this—a sound reason, to be sure. Tetraethyl lead has demonstrated its economic usefulness in a widening orbit to the oil industry and in turn to the motoring public. Today, simply by taking the knock out of gasoline, tetraethyl lead sets in motion a chain reaction of progress in which our modern automotive economy operates efficiently, the consumption of petroleum and other natural resources is conserved, and substantial economic benefits accrue to the motoring public.

A recent study of the economic value of tetraethyl lead showed that its use in 1950 reduced effective gasoline consumption by at least 10 percent—or an

[1] Mr. Costello, vice president of Ethyl Corp., delivered before the 25th annual meeting of the Lead Industries Association at White Sulphur Springs, W. Va., on April 10 an address entitled "The Consumer Looks at Lead." The following condensation of that talk is presented as a matter of reader interest.

estimated 4 billion gallons. That represented a cash saving to the American public of over $1 billion on its annual gasoline bill. Stated another way, the use of perhaps 105,000 tons of metallic lead was sufficient to save some 12 million tons of gasoline.

Tetraethyl plays an important role in our economic life. And by its widespread use a vast amount of our natural energy resources is conserved. This saving far outweighs the resource value of the lead that is consumed in its manufacture.

The economic value of other lead products can be similarly demonstrated. Indeed, the entire trend of lead consumption in recent decades has been dictated primarily by the economic usefulness of the products made from it. In 1929 the five leading uses of lead were for cable coverings, batteries, white lead, building material, and ammunition. By 1950, 3 other uses—tetraethyl lead, solder, and oxides for uses other than batteries—moved into the first 5.

The comparisons illustrate some of the technological developments that have affected lead demand. They demonstrate how lead has become more valuable for some products, less valuable for others. While lead has scored impressive gains in some consumption categories, it has lost ground in other directions due to the increased competition of other materials.

Because it represents the only comprehensive effort made to look into the future of our commodity and energy resources, the President's Materials Policy Commission Report, sometimes called the Paley Report, has now supplanted the well-known crystal ball for prognosticating what is to come.

UNDERSTANDING THE PALEY REPORT

Without question the aims and purposes of the Paley study are most laudable. A factual knowledge of the United States raw materials position, and of production and consumption trends for the next quarter century should prove to be of inestimable value in planning national policy. In this connection, a great number of its recommendations for legislation to give industry relief from taxes and other oppressive Government regulations, as well as aid in exploration and development work, show that the Commission had a real grasp of the problems ahead.

It is unfortunate, however, that some of the materials projections in the Paley Report have been mistaken for flat predictions in some quarters. Indeed, the Commission itself carefully pointed out: "These projections do not predict how much of each material will actually be available and consumed. Instead they are an estimate of what might be demanded if relative prices of various materials remain the same as in early 1950, which they are most unlikely to do. Moreover, these projections assume no unforeseeable new uses, substitutions, or technological improvements. They are intended only as a starting point in the analysis of prospective supply-demand relationships and give only a rough measure of magnitude."

It is these very considerations, cited in the Paley Report, which make it so difficult to attempt a long-range forecasting of lead demand with any degree of accuracy. A simple mechanical extrapolation of existing uses does not give the answer. Social changes, technological improvements, and competition between materials will dictate the future for any commodity.

Illustrative of this is the projection involving storage batteries. For this major use, the Paley Commission projects an increase in lead consumption from 416,000 tons in 1950 to 707,000 tons in 1975. And in making that projection, the Commission, in line with its stated objective, assumed the same average battery life in 1975 as in 1950.

While the average battery's life right now is only 2 years, many battery manufacturers feel that they can produce a battery which can be guaranteed for 3 years' service. In another direction, the battery companies have achieved a marked reduction in average lead content per battery from years ago, and they are confident a further substantial decrease will be seen in the years ahead.

Accordingly, if we assume an average battery life of 2½ years by 1975, instead of the present 2 years, and if we assume a reduction in average lead content per battery from 23 pounds to 20 pounds, which also seems conservative, it is possible to show a 1975 demand for lead in the battery field that is some 200,000 tons less than listed by the Paley report.

LONG-RANGE FORECASTS IMPOSSIBLE

Effects on lead consumption might be explored from a technological standpoint on numerous other lead products. Add to this the important influence of raw-material price on end-product use, and it is apparent why a 25-year forecast for lead demand cannot accurately be made. All that can be done is to indicate the general trend.

We are, therefore, not greatly concerned with the fact that the Paley Commission report forecasts a demand of 1.95 million tons in 1975. The actual demand will be influenced by a number of factors, particularly of a technological nature, which are not now apparent. Moreover, the price which consumers will be required to pay for lead in the future will have a substantial bearing on the volume of demand. Production capacity also will be influenced to a much greater extent than is contemplated in the Paley report by the price of the commodity. There is little doubt in our minds but what the normal economic forces will work in the direction of bringing the demand and supply into balance.

FUTURE LEAD SUPPLIES ADEQUATE

As a substantial consumer of metallic lead, Ethyl Corp. has a serious interest in the long-term outlook for supplies. We have tried to compile such information as is available in order to assure ourselves that there is a sufficient potential productive capacity to meet any reasonable increase in the demand for lead. We believe that the potential not only exists, but we are confident that adequate supplies will be forthcoming in the future to meet all essential needs. We have expanded our manufacturing capacity and are gearing our present operations and future plans with the full confidence that this prediction will be a correct one.

Regardless of what we may think of the long-range outlook for lead, we still have the problems that are with us today and are likely to continue in the near future. The recent history of lead has been one of recurring short supply and high prices, followed by long supply and concurrent low prices. We have never liked this situation, but we have come to believe that it is the "nature of the beast." We consumers would rather have low-priced lead than excessively high-priced lead, but what would be best for both consumers and producers would be for the supply of lead to remain in balance and the price to be reasonably constant at a level where both the consumers and producers can make a profit.

If we agree that the general trend in lead demand is upward, then it must be admitted that this country will continue to follow the experience of the past several years and remain a net importer of lead. Consumers must face this fact and make their plans accordingly. While all United States consumers have a full appreciation of the desirability of keeping the American mining industry strong, they must also accept the responsibility for encouraging and supporting the foreign production of lead, upon which they must now in part depend. It therefore follows that any Government action that will have the effect of discouraging imports and reducing the expansion of foreign mining properties is undesirable from a consumer standpoint.

The great need in the lead industry is for a reasonable balance to prevail between supply and demand. This balance, which is so necessary for the continued health and well-being of the industry, can be attained, but only if the industry is permitted to work out its own economic problems and is not hampered either by restriction on the uses to which the product is put or excessive taxation on either domestic or foreign production.

How antiknock compound increases the working and earning power of heavy-duty vehicles:

It is estimated that, in normal times, the quantities of antiknock compound used in gasoline increase its antiknock quality about 10 octane numbers. Such an improvement allows an increase in engine compression ratio which, in one commercial vehicle engine, produced gains in power output and fuel economy that resulted in:

...18% faster acceleration with the same load

...76% more pay load and 7% better gasoline mileage on the same operating schedule over a route through level and hilly country

...16% higher speed on mountain grades

ANTIKNOCK COMPOUND

A few drops in each gallon of gasoline is helping trucks and buses climb hills more easily, haul heavier loads and step up schedules

When a modern truck or bus parks alongside an old-timer, you don't have to be an automotive expert to tell which is which. The advances in design and construction are readily apparent. But one of the most important improvements of all is hidden from you. It's inside the gasoline tank.

For more than twenty-five years refiners have constantly improved their gasolines. Automotive manufacturers have taken advantage of the improved antiknock value of such gasolines by developing higher compression, more efficient engines. During this period an engine of given size has produced more and more power and steadily improved gasoline economy. Actually today *two* gallons of gasoline can do the work of *three* gallons of 1925 gasoline—yet the price per gallon, excluding taxes, is about the same.

What has made it possible for refiners to economically produce vast quantities of greatly improved gasoline? First, the development of new and better refining methods which provide higher octane-base gasolines. Second, the addition of antiknock fluid to these better base stocks, which improves them still further.

In normal times, the use of antiknock fluid adds an average of about ten octane numbers to gasoline used in the U. S. Without this antiknock fluid, neither gasoline quality nor commercial-engine performance would be at their present levels. When you consider the role that trucks and buses must play in America's defense program, antiknock fluid today is a product of top-ranking value and importance.

ETHYL CORPORATION

NEW YORK, N. Y. • DETROIT, MICH.

Manufacturers of "ETHYL" *antiknock fluid*

CHAPTER XXV. GOVERNMENT AND MATERIALS RESEARCH

The Commission shows that scientific progress is dependent upon expenditures for research by industry, Government, and the universities. These expenditures require sufficient trained personnel so that they may be effective in advancing technology. The Commission says:

"To start with the bulk figures: In 1952 it is estimated (by the Research and Development Board of the Department of Defense) that $2.9 billion will be spent on scientific and industrial research in the United States, although how this will be divided between pure or basic research and various degrees of applied research can only be guessed. This figure is close to 1 percent of the gross national product (current dollars). As of 1952 the United States had about 625,000 trained scientists and engineers—once again, about 1 percent of the Nation's working force. Of these, about one-fifth are engaged in research, with effects and at levels of importance impossible to specify."

In the past universities have played an important part in furthering fundamental research, as well as in training personnel to man industrial and Government laboratories. The Commission states:

"That the universities now perform only 10 percent of our research, and pay for only 3 percent, is more than a little disquieting; some scientific institutions are now so completely beholden to Government—to say nothing of industry—for their research support that it is hard to imagine how they would continue their basic programs were this support to be withdrawn."

This is a serious problem as our scientific institutions and universities should certainly not be so completely beholden to Government. Recent tax laws are responsible for the difficulties which private institutions face in raising funds. The fall in the purchasing power of the dollar and the low yield on endowment funds have contributed to the difficulties faced by the private colleges. The Commission's comments on research personnel are significant:

"Of the total United States population of scientists and engineers, roughly 625,000, 1 in 5 is a research worker. Two-fifths of the scientists contribute to research, but so adaptable are engineers to a multitude of jobs that fewer than 15 percent of their total number classify as research men. In round numbers, then, some 76,000 scientists and 59,000 engineers carry the research load for the entire population of the country. Nearly 60 percent of the total work in the laboratories of private industry, about 20 percent are employed by Government and 20 percent are lodged in educational institutions, foundations, and the like. Such manpower is among the Nation's most precious resources, because without it our technology could not advance. A very small number of these highly trained men can effect major material changes, and hence social changes; their deployment by fields of endeavor has therefore a real relationship to the materials problem."

Naturally this Commission is particularly interested in the earth sciences. The following statement is worthy of serious reflection:

"Only 4 percent of the total are earth scientists (geologists and geophysicists), and this fact undoubtedly has some bearing on our present lag in exploration for metallic ores. In fact, only 3,000 researching scientists in the country fall into the earth science classification, and a large number of these are engaged in petroleum research."

The Commission raises the question as to what the future holds in available technical manpower. The following paragraphs are significant:

"The combination of high demand and short supply has created a job market for technical graduates the like of which never existed before. The Engineering Manpower Commission of the Engineers' Joint Council estimated that in 1951 there was a need for 80,000 engineering graduates; only 41,000 engineers finished their schooling that year and many of these were susceptible to being drafted into military service.

"This situation arose suddenly. Until the United States began to mobilize its defenses after the outbreak of conflict in Korea, an unusually large crop of post-

war bachelors' degree holders in science and engineering appeared to be adequate to fill the number of jobs open. Particularly in engineering, some educators and Government statisticians believed that graduates in those years would encounter trouble finding immediate work. Publication of these beliefs had an effect upon entering classes of freshmen, and these numbers began going down only a little while before the demand for employment of new graduates began to rise again, quickly and sharply. Because of the 4-year time lag needed to convert a freshman into a bachelor's degree holder, supply and demand began to cause an extremely troublesome tide rip in 1950–51. Nor will this disturbance soon disappear. The number of all college graduates through the year 1955 is roughly estimated by the number of young people who have already entered college, and the 1956 crop can be estimated this fall. To industries needing trained technical and scientific workers the figures are discouraging, for they continue to run down hill through a period which everyone prognosticates as one of continuously high demand."

In view of the fact that the Commission has laid so much stress on Government forecasting and planning, it is significant that the present dirth of engineering students can be traced to a statement a few years ago emanating from the Commissioner of the Bureau of Labor Statistics, which suggested that graduates of engineering schools would encounter trouble finding immediate work. The engineering schools have had to live down this unfortunate statement ever since in recruiting high-school graduates for a technical career. If the Bureau of Labor Statistics can make so inaccurate a forecast of the immediate demand for engineering graduates, it is difficult to take any of the forecasts made by the President's Materials Policy Commission for the year 1975 very seriously.

The recommendations embodied in this chapter again deserve comment and careful review. The Commission believes:

"That the appropriations of the National Science Foundation should be increased to the $15 million limit which the Congress wrote into its basic act, and that the Congress should re-examine the bases upon which it set this limit so low."

The Commission says:

"The Bush report which initiated the idea of a National Science Foundation, called for an annual budget of $122.5 million. The President's Scientific Research Board (1947) thought that $250 million would be a more suitable figure. On the basis of such judgments on the level at which the Federal Government should support basic research, the $15 million stipulated by law as a ceiling for annual appropriations to the National Science Foundation is inadequate, and the $3.5 million actually appropriated for 1952 even more so."

This recommendation again assumes that more Government planning and more Government funds will solve all our problems. Since the Commission has demonstrated that the big problem before us in research is a shortage of trained personnel, it is difficult to understand how the mere appropriation of millions will produce any significant contribution.

The Commission also recommends:

"That Government, wherever feasible in the course of its procurement programs, specify only the performance characteristics of an article, the manufacturer then having the opportunity to conserve material so long as performance s ecifications are met.

"That the Secretary of Defense and the Administrator of the General Services Administration be directed to report annually to the President on the progress made by their respective agencies during the preceding year toward saving materials."

The Government with its large procurement for defense can certainly make a contribution by simplifying specifications and eliminating waste. Needless to say, such economies should also be reflected in savings to the taxpayer, which is a desirable end in itself.

The final recommendation in this chapter states that:

"The Commission believes establishment of an active coordinating body is essential to shaping and executing a comprehensive, effective national policy of materials research. Such an organization should estimate and appraise the impact of technology and other forces upon supply. It should perform such tasks as—

"To revise on a continuing basis estimates of reserves in the light of new discoveries and the development of new uses and new methods.

"To project annually requirements on supplies at least 10 years into the future on the basis of scientific and technological developments as well as of data on domestic production and consumption, and imports and exports.

"To report potential shortages of important materials to Government, industry, and the public far enough in advance to allow time for corrective action.

"To maintain on up-to-date list of the materials research and development projects that should be undertaken; and, for those that cannot be assumed by industry in the normal course of events, to consult with appropriate advisory bodies, and, if necessary, to bring the problem to the attention of the President and of Congress.

"In order to discharge these duties, the proposed central agency should be placed high in the structure of the Federal Government. It would need to maintain close relations with the National Science Foundation and the many agencies of Government concerned with separate phases of materials research and with industrial and other private research agencies in the United States; and, in the foreign field, it would need to keep in touch with governmental and private developments that concerned materials. But the technological problems of materials are only a part of the task that Government must perform, and this work must be closely related to action on all other materials fronts, as the Commission describes and recommends in chapter 31.

"Only through such a broadly based coordinating organization can all the diverse elements of materials technology be kept under review as a group and properly related to other aspects of the entire materials problem so that it can be dealt with whole."

Here again we have the one sure cure—as for all other problems—namely, the establishment of another Government agency with new powers, additional personnel, and additional costs to the taxpayer.

CHAPTER XXVI. TECHNOLOGY AND BUILDING—A CASE STUDY

The Commission reviews the building industry which, according to the Commission in 1950, took one-third of the copper, one-sixth of the iron and steel, one-fifth of the lead, one-fifth of the zinc, and almost two-thirds of the lumber that was used in this country. It reviews at length the problems which have characterized the building industry. It says:

"None of the barriers to more efficient use of materials is immovable, but there are many of them and their roots go far down into the past and spread widely through the economy. They can be traced to four principal causes—the way the industry itself is organized, the numerous restraints of trade that prevail in the industry, inflexibility of most building codes, and inadequacy of research in the field."

The first barrier lies in the nature of the building industry:

"The industry includes a large proportion of small, inefficient builders, although a number of larger firms makes effective use of equipment, methods, and materials.

"Usually, the small builder operates on credit granted him by materials distributors or financial institutions and is, therefore, subject to the restrictions of these lenders. He must deal with a notoriously costly distribution system, while the large builder more often deals directly with the materials producers or even produces his own materials. Distributors often attempt to protect their market by combinations to boycott producers who circumvent the distributors and deal directly with the builder. Further, the small builder, operating on individual orders, cannot plan his marketing nor use initiative in introducing new methods and materials.

"Experience has shown that organizational efficiencies cannot be achieved by very small building enterprises. The number of large firms is growing. Consistent with development and preservation of healthy competition, there is room for further consolidation of smaller firms into larger units, including the bringing together of producers, distributors, and builders.

"Labor, as well as the small builder, has sought to protect itself against the rigors of the fluctuating construction market, and has successfully used the craft union for this purpose. Craft organization has sometimes led to costly jurisdictional disputes, opposition to shop fabrication of building parts, and to new materials and methods. It has also led to make-work policies and to limitation of entry into the craft. Although the small builder in many cases does not use unionized labor, the seasonal, temporary nature of his operation pushes up his labor costs because wages must be high to make up for periods of unemployment. Larger builders can more nearly guarantee annual wages, specialize the labor force, and train labor in particular materials-saving operations."

This discussion of the problems besetting the building industry due to its organization should be brought to the attention of those who condemn bigness per se in other areas and who would destroy the large integrated firms in industries such as petroleum, which have been able to achieve declining real costs for their customers.

The second obstacle is due to restraints on trade. The Commission says:

"Restraints of trade have long been exercised in the building industry, and they continue despite the fact that about one-quarter of all cases brought under the Federal antitrust laws has involved this industry."

The Commission recommends:

"That the Department of Justice and the Federal Trade Commission intensify their efforts in the building and building-materials industries. The Department of Justice and the Federal Trade Commission should study the need for legislation authorizing prosecution in the case of restraints that cannot be reached under present laws."

The third obstacle is attributed to building codes. The Commission believes that the inflexibility in outmoded building codes retards technological develop-

ments which would tend to advance the industry, and conserve critical materials. It says:

"One path to improvement is development of uniform codes based on standards of performance rather than on particular specifications of materials and techniques.

"The performance type of code does not restrict the builder and owner to any specified methods or materials. If the structure can be shown to 'perform' satisfactorily by the standard of general welfare it complies with the code, regardless of materials or methods used. Such a code is more difficult to administer, but does allow for continuing change and improvement in building construction."

The fourth obstacle is the inadequacy of research in the building industry. The Commission believes that:

"The disorganization, low capitalization, localism, and conservatism which plague the building industry have discouraged research by the industry. Professional and technical associations of engineers, architects, and builders exert some influence on technical progress, but their approach is at best sporadic and unorganized. Producers of materials conduct considerable research limited chiefly to improving and developing particular products. There has been little research in the performance of products when combined with others into elements and components of structures.

"In agriculture, which, like building, is made up of a multitude of small, localized, low-capital units, the Federal Government and State governments have assumed most of the responsibility for research. In building, Government research is far less extensive. The Housing and Home Finance Agency, which is responsible for housing research, has had to curtail rather than expand its research program. In 1950 its appropriation permitted allocation of about $3.3 million for research; in 1951, about $1.2 million; and in 1952, only $445,000."

The Commission believes:

"The Government's role in research should be largely one of coordination and development of basic standards, with active participation only where non-Government groups cannot adequately do the job."

Therefore, the Commission recommends:

"That the Housing and Home Finance Agency be given continued and increased financial support in its housing research program. Federal-housing and slum-clearance programs should take the lead in applying the improved techniques and design developed by building research. Coordination, free interchange, and broad dissemination of research findings can perhaps best be accomplished with the assistance of a nongovernmental agency, such as the Building Research Advisory Board."

The Congress reduced the appropriation for housing research to only $445,000, as it too believed that the Government's role in research should be largely one of coordination. Particularly under present conditions with the heavy demands on the Treasury, such expenditures should be minimized.

The Commission recommends:

"That an agency of the Federal Government formulate and keep up to date national standards of building construction with the participation of an advisory board consisting of representatives of interested Federal agencies and non-Government technical groups.

"That these national standards be of the performance type where possible, and where specification of acceptable materials and building methods is necessary such specification should be frequently revised to include all acceptable alternative materials and building methods.

"That the results of housing research conducted by the Housing and Home Finance Agency and of all other Government-supported building research be promptly considered for incorporation in the national standards by the agency given the responsibility for formulation and revision of these national standards. National standards should be applied to all construction paid for with Federal funds or built on property under Federal jurisdiction. Federal building construction should not use materials in excess of the minimum quantities established by the national standards, except in such cases as monuments and buildings following an existing architectural plan."

This recommendation might be helpful, but here again the Commission, after paying lip service to private enterprise, shows that it has no real solution to any problem other than to introduce additional government compulsion. It makes three recommenadtions:

"That the Housing and Home Finance Agency cooperate in the formulation, adoption, and frequent revision of the recommended national standards. When

adopted by the Federal Government these national standards should become the 'minimum construction requirements' of the Federal Housing Administration for the granting of mortgage insurance.

"That the Federal Housing Admiinstration should not grant mortgage insurance for housing constructed in areas which have building codes and zoning laws which do not permit use of alterantive materials permitted by the national standards.

"That the principles recommended for the administration of the housing program of the Federal Housing Administration should apply to the housing program, including both new houses and improvements, of the Veterans' Administration."

It is quite obvious that if these recommendations were adopted, the Federal Government would be in a position to dictate building standards throughout the country. The code recommended by the Federal Government might be a better code but it would be more desirable to wait a little longer and see such a code adopted by the States and the localities than to lose local self-government to a Federal bureaucracy in order to save some materials.

The Commission concludes with the recommendations:

"That the Federal Government should apply the National Standards recommended above to public housing programs carried out with the aid of Federal grants or loans."

This recommendation again introduces further Government compulsion in the housing industry.

FOUNDATIONS FOR SECURITY

CHAPTER XXVII. MATERIALS POLICY AND NATIONAL SECURITY

This chapter is one of the most important in the report as it deals with subjects of such paramount importance. The Commission states that:

"Military security depends heavily on a vigorous and expanding economy to produce the overwhelming quantities of the equipment, machinery, and supplies necessary for modern military strength. On the other hand, healthy economic growth depends importantly on military security to maintain that climate of confidence in the future in which private enterprise flourishes. Neither military nor economic strength can be raised to its highest potential without an abundant and varied flow of materials.

"Planning for a materials base that would stimulate the economic growth of the free nations has been the objective of the Commission throughout its studies. But beyond this, materials preparedness to help avert a war, or to promote victory if war should come, requires special and continuing actions affecting both supply and demand."

On the demand side: "Potential wartime military requirements for materials must be carefully estimated to identify specific materials problems and to program materials actions.

"Workable plans must be made to assure the swift, smooth allocation of materials to military and essential civilian production if war should break out.

"Military consumption must be stringently controlled, before as well as during a war, to avoid excessive drain upon scarce materials while assuring military strength."

On the supply side:

"The Nation must maintain a strong and expanding economy with a large and diversified materials base that can be tapped for war production, with special attention to providing prime essentials such as steel, electricity, petroleum, and aluminum whose expansion takes considerable time and whose production sets the pace not only for economic growth but also for production in wartime.

"Military goods must be produced during the cold-war period to provide military 'strength-in-being,' and extra capacity must be available to permit prompt expansion of military output in the event of all-out war.

"Provision must be made for extra sources of materials to close the gap between supplies and requirements which would develop in wartime for many materials, both because of drastic increases in demand for ourselves and our allies, and because of curtailment of normal supply through enemy action.

"In event of war demand for most materials would rise abruptly and for some materials, such as additives for high temperature alloys, it would reach peaks far above peacetime levels. The basic cause would be the greater appetite of war production for materials, particularly minerals, and the specialized requirements of technical equipment and services. Demand is heavy during the early buildup period when new plants are being put up and military production pipelines being filled. The demands of our allies would rise at the same time as our own and for the same reasons.

"The changeover from peacetime production to military and essential civilian output would have to be achieved quickly. Demand for extra materials, and for those of special war importance, would be heavy and immediate.

"The level that demand would reach for all materials, and for each material, will require continuous recalculation. After an initial buildup period, the input of materials would match with output of military and essential civilian supplies. The level to which total production for ourselves and our allies could be pushed would be limited only by the ability of the total economy to produce; the demand for materials would depend importantly on the percentage of the total directed toward military products. During the last war, the United States concentrated more than 40 percent of its total output on military purposes (1944–45). If we diverted a similar percentage now, the absolute requirements for materials would

be higher since total national production is higher now than it was in 1944–45 (discounting the price inflation that has occurred). Moreover, in such a war of survival as the free nations would face, military allocations could be expected to cut more deeply into national production and perhaps would exceed 50 percent of the total.

"There are four main reasons why such a large percentage would need to be devoted to direct military use.

"First, the more quickly a large striking force could be assembled, and the more effectively armed that force was, the more quickly the free nations might hope to overcome aggression.

"Second, the United States and its allies have high standards of care and supply for the fighting man, their Armed Forces are highly mechanized and better supplied: Typically, a soldier in Korea requires 35 percent more cargo landed per day than did a fighting man in the last war.

"Third, warcraft are increasing in size: larger aircraft carriers, heavier tanks, outstandingly larger planes—the B–29 giants of the last war are classed now as 'medium bombers.' A jetplane of 1951, compared with its forerunner in 1944, requires twice as much copper and steel, two and a half times as much aluminum. Moreover, the greater complexity of modern equipment exerts another kind of demand: for special materials virtually unused before. Typical of the new technology is the requirement for uranium and other special metals—beryllium, zirconium—for atomic warfare and the manufacture of atomic materials; columbium and other alloys for high-stress, high-temperature machines; germanium for electronics. As time goes on and new methods and weapons of warfare come to the fore, the chances are strong that materials demand will continue to grow in size and complexity.

"Fourth, increased requirements grow out of the strategic situation of the United States and the free nations, the logistics of highly mechanized warfare fought at great distances from bases of supply, and the fact that materials must be garnered from many countries, and consequently require unprecedented quantities of shipping.

"The main problem of supply is that the United States own resource base would not be adequate. The fact that our allies would be increasing their demands at the same time would limit the supplies from outside the country on which the United States might draw. Moreover, domestic facilities might be bombed. Free countries which supplied key materials might be subverted or invaded, or enemy action might damage facilities or sink cargoes.

"The United States materials supply would be much more vulnerable in another war because of the increasing need to go abroad for larger quantities of more materials.

"In the first 7 months of the last war, enemy action destroyed 22 percent of the fleet bringing aluminum ore to the United States, and oil and gasoline tanker sinkings averaged 3.5 percent per month of tonnage in use."

The Commission stresses the supposed dependence of the United States on foreign sources and how such materials are vital to our security. It assumes that nothing can be done to lessen this dependence. It says:

"The United States largest current supplier of chrome for steel is Turkey. The Nation draws copper from Africa and the west coast of South America. It uses petroleum from upper South America. Tin comes from the Far East as well as from Bolivia; lead from Canada and Mexico; bauxite from South America; iron ore from Venezuela, Liberia, and soon from Labrador. For three key commodities—tin, quartz crystal, and industrial diamonds—the United States is 100 percent dependent on foreign sources. The Nation's position is worsening for 25 other key commodities; in fact, in 1952 the United States had become virtually dependent on foreign sources for 4 of these. The United States produced (1951) only 55 percent of the lead, 38 percent of the bauxite, 26 percent of the antimony, 20 percent of the flake graphite, 10 percent of the cobalt, 9 percent of the mercury, and 8 percent of the manganese it used. Obviously, enemy action could reduce or stop the flow of many key materials."

In order to match demand and supply under the conditions of a modern war, the Commission states that an effective materials policy would have to:

"Provide materials strength-in-being, available immediately on the outbreak of any war, to meet the first upsurge of demand with those materials whose supply might be curtailed and especially with those materials used in greater quantities in wartime than during peace.

"Assure for the transition to full mobilization adequate sources of current supply to provide the right materials at the right rates to permit the United States to reach peak military and essential civilian production smoothly and swiftly.

"Assure that, once full mobilization had been achieved, there was a safe and continuing supply for an indefinite number of years of high demand.

"The Commission has considered 10 main steps that can be taken by the United States to prepare for matching materials wartime requirements and supply; most have already been initiated."

The 10 steps are:

"Both during the cold war and in any hot war, tailor the military quota of materials to the minimum needed to provide the necessary volume and proportions of military end products.

"Maintain an even-handed control over both military and civilian demand under emergency conditions.

"In designing military products, and in drawing up specifications, focus on using abundant rather than scarce materials, and on using less of any material per unit of produce where this can be done without significantly affecting quality of performance.

"Place greater emphasis on care and maintenance of military equipment and conservation in use, and increase scrap recovery of all kinds.

"Prepare 'standby' design and specifications for equipment and other items, for use only in extremity, to substitute available materials for those that may be cut off during war, even though substitution may entail some reduction in quality or may increase cost.

"Promote an accelarted growth of materials production, processing and transportation capacity, particularly in steel, oil, aluminum, and electricity, as part of the preparedness program.

"Stockpile strategic and critical materials.

"Set up emergency standby facilities, or expansible cores of industries for emergency production, both in the United States and in safe areas abroad.

"Set up domestic in-the-ground reserves of key materials by limiting extraction of certain materials, by accelerating development of known reserves, by blocking out low-grade deposits for future development.

"Accelerate development of new production techniques through pilot plant or small commercial scale operations for increasing supplies from unconventional sources, such as oil shales, aluminum clays, and process recovery of manganese."

The Commission once again states that we must seek the lowest cost solution to our security problem. It says:

"The basic policy of seeking lowest cost sources of materials cannot, of course, be paramount in solving security problems, but neither can it be considered a negligible factor even during a war; during the cold war keeping costs low will be vital. The aim at all times should be to find the lowest cost solution that will provide a secure supply. Granted that setting up the criteria for determining what is or is not 'secure' in a military sense can be difficult in the extreme, and that the security of any given source may alter with changing international conditions, the United States nevertheless should generally avoid, at least during the cold war, the high and continuing costs of such alternatives as subsidized domestic production."

The Commission, however, is hardly consistent in that it has frequently recommended long-term purchase contracts and other devices which subsidize domestic and foreign production. Apparently, it is only referring to subsidies via the tariff route. If a tariff, or the encouragement given by the "Buy American Act" would accomplish the desired result at a lower cost to the taxpayer, than long-term purchase contracts and the other devices recommended by the Commission, then these methods are certainly worthy of consideration.

The Commission clearly shows that stockpiling is one of the alternatives to a subsidy. It says:

"Other devices will accomplish the same ends at lower cost. Stockpiling frequently offers an attractive alternative to such subsidies. Basically, the costs of stockpiling are the storage, administration, and carrying charges on materials, since the stocks normally will not decrease in value. Maintaining production facilities for subcommercial grade materials over a number of years is likely to cost more, in subsidies, in higher prices, and in the creation of a high-cost industry that may demand tariff protection at a later date. And this course of action could leave us in emergency stripped of domestic reserves when we need them most."

The stockpile law specifically provides that domestic sources are to be used, as an industry in being is part of the security the act was designed to achieve.

The present stockpile law represents a practical solution to the problem and it should be continued.

The Commission discusses the necessity of stockpiling materials such as manganese, and says:

"Manganese offers a case in point. The United States produces about 10 percent of its annual requirements at prices competitive with those for foreign manganese. The Nation has the known reserves of ore to meet its full requirements, but most are of relatively low grade, and at present levels of technology increased domestic production could be called forth only at progressively higher prices; most of the additional output, in fact, would have to bring a price more than double that of foreign manganese. In the spring of 1950, when the price of imported manganese, including duty, averaged about 77 cents per unit, domestic production was at an annual rate of about 115,000 tons of metallurgical ore. It was estimated at that time that a price of 80 cents per unit would induce 21,000 additional tons of domestic production, and a price of $1.50 a further increase of 275,000 tons. Even at the $1.50 price level, the United States still would have had to look abroad for most of its manganese; a price of $2 per unit would have been required to make the country self-sufficient.

"At such levels, guaranteed self-sufficiency compared to stockpiling becomes too costly in terms of manpower and production capacity as well as in money."

The Commission concludes with this statement:

"For security, as well as for all other aspects of materials policy, the Commission wishes to emphasize that lowest real cost within the limits of assuring safe supply must remain a decisive factor. Unless the United States manages to solve security problems of supply with the least feasible excess use of manpower and treasure, it will be weakening its economy and thus damaging rather than strengtheining its own security and that of its allies."

CHAPTER XXVIII. STRETCHING SUPPLY BY EFFECTIVE USE

The Commission reviews the possibilities of extending our supplies to meet emergency conditions. It says:

"In effect, the Nation has a somewhat expansible budget of materials, fabricating capacity, and manpower and must fit into this budget the important military requirements and the maximum feasible civilian demand. The division between military and civilian will vary with the urgency of the current situation. For the cold-war period, it is important to make as full use of the Nation's productive potential as possible for both military and civilian ends since this helps to exand the total economy and thus will provide a broader base from which to draw in times of greater emergency."

This is an important statement as it indicates the necessity of protecting the Nation's civilian economy during a cold-war period such as the one we are now passing through. The Commission continues:

"In a hot war, the military becomes the prime claimant for materials, manpower, and fabricating capacity, but the point undoubtedly would be reached in any all-out war when further reduction of civilian quotas could have as devastating effect on the total effort as would failing to provide the military with additional products.

"When that point is reached in a war economy, the efficiency of the use of materials, and the careful measurement of highest priority uses, both military and civilian, becomes of crucial importance. The more that material requirements per unit of military products can be reduced without serious injury to quality and performance, the more units can be produced from a given supply of materials, and the more materials will be available for allocation to essential needs of all kinds."

The most effective use of materials cannot be made during war conditions unless military planning during peace gives the proper weight to the materials problem. The Commission says:

"Imperative in war, conservative use can accomplish maximum benefit for the Nation only if it has been practiced vigorously in peacetime. There are two main reasons:

"First, military consumption of materials in a preparedness period is a drain on the rest of the economy which makes it more difficult to maintain a high rate of general economic growth. Both because its strength depends ultimately on the economy and because conservation is in the public interest, the Military Establishment has a responsibility to use materials as efficiently as possible.

"Second, if war should break out, the designs of weapons and equipment then in use are the ones that generally would have to be put immediately into mass production; the insistent demand for military products could not be put off while weapons were redesigned and military practices altered to achieve mandatory materials savings. The Commission is convinced that savings must be devised in advance as an integral part of the preparedness process; they must be a principal object of current policy and practice and become imbedded in tradition, literally as a habit of mind."

The Commission suggests four programs to be adopted by the armed services as a keystone of their materials policy. They are:

1. "Using allocations and related controls for assuring that demand is tailored to the amounts necessary to do the job during the current emergency.

"Though, in the Commission's judgment, application of the controls is clearly essential in the current emergency and would be mandatory in event of all-out war, it does not follow that a full pattern of active controls must be retained indefinitely in a cold-war period. The avowed object of the present program is to ease, and eventually to lift, various controls as the transition to partial mobilization is completed and as expansion programs succeed in striking a balance between general supplies and demands for materials.

"Nevertheless, the Commission believes the Government must be ready to reactivate controls promptly in the event of a later emergency, and steps should be

taken in advance to facilitate the action if it becomes necessary. In this connection, there should be no letup by the Military Establishment in improving its machinery for determining and adjusting military requirements well in advance of potential war situations."

The Commission should be commended for its statement that "The avowed object of the present program is to ease, and eventually to lift, various controls." Controls should be eliminated as rapidly as possible so as to restore the full vigor of competitive enterprise.

2. "Shrinking military requirements by designing equipment for the most efficient utilization of materials.

"The Armed Forces should use substitution, redesign, research, and conservation to stretch materials, without sacrificing the efficacy of armaments. Armaments should be the best and in ample quantities, but it will be possible to accomplish this and still economize on materials in their production and use, subject, like all other steps the Commission has recommended, to the overriding imperative to assure economical use of manpower and industrial facilities so as to meet necessary military requirements at lowest real cost per unit.

"Making the best of available materials need not result in any sacrifice of combat strength. Battleships fought just as well in the Second World War with steptreads made of secondary rather than primary aluminum.

"Rubber or plastic lining for tanks serve the same purpose as stainless steel. Steel has been substituted for brass in shell casings to save copper and zinc. Experiments conducted by the Navy with superfine fiber glass may lessen the need for asbestos as an insulator."

3. "Preparing standby designs for use only in extremity to substitute at some sacrifice of quality the available materials for those that are scarce or cut off by enemy action.

"The type of substitution suggested so far would not seriously reduce the quality of military equipment and supplies. Substitutions of another sort also should be considered. In some cases, the materials on which military machines or equipment depend are scarce, or may be cut off from the United States in wartime, and no substitute for them is known that would not impair quality. Yet use of substitutes may become unavoidable in war extremity. It would be the part of prudence to single out instances where substitution might become unavoidable and to prepare emergency designs calling for the best of available substitutes. Designs of this sort would be held in readiness for use, should the supply of the preferred material be cut off."

The three recommendations already listed are to be implemented by the Commission's recommendation:

"That the Research and Development Board give pointed and continuing attention to finding ways by which the Military Establishment can make more efficient use of materials and contribute more to improving the Nation's general materials position; that the Board be directed to report annually to the President and the Congress through the Secretary of Defense on the current status of research and progress in this field."

This Commission then recommends:

4. "Promoting the best maintenance of equipment and all other military property and extending the recovery of scrap.

"Discipline and care in the use of materials should extend from estimates of need, through packaging, shipping, storage, and issuance to field maintenance and recovery of scrap. In the military service, as the Report on the Wartime Experience of the Army Service Forces shows, there are great opportunities for economy without loss of combat efficiency.

"New opportunities for more effective supervision and direction of maintenance and efficient use of materials and equipments have been afforded by the unification of the armed services. The Industrial College of the Armed Forces gives considerable emphasis to the problems of scarcity and conservation. The military authorities are to be commended on the economies effected through conservation, through unified purchasing, and particularly through efforts toward standardization and uniform cataloging but they would undoubtedly be the first to agree that great room for further improvement remains.

"The recovery of scrap greatly reduces the demand for new material, and many industries depend heavily on scrap. If there should be a full-scale war, the need for scrap of all kinds would instantly soar. Military reclamation of

obsolete and scrap materials, if effectively practiced, can add substantially to the supply of scarce materials.

"The Military Establishment has long reclaimed and recycled some scrap, and since the war its performance has improved."

To implement this recommendation, the Commission recommends:

"That the Secretary of Defense, jointly with the Secretaries of the Army, the Navy, and the Air Force, and with the cooperation of the Bureau of the Budget and the National Security Resources Board, undertake a thoroughgoing review and appraisal of existing organizational and procedural arrangements within the Department of Defense for insuring vigorous action of all types and at all points to conserve scarce materials, and to increase scrap recovery with a view to strengthening such arrangements wherever appropriate."

CHAPTER XXIX. BUILDING AND MAINTAINING STOCKPILES

The Commission recognizes the importance of stockpiling as a key element in our program of defense. It says:

"The materials in stockpiles constitute strength in being for the first surge of demand if total war breaks out, and are planned further to supplement supplies for an all-out war of considerable duration. The United States stockpiles are not yet adequate to these ends. Stockpiling of strategic materials was not established as public policy until 1939. The current stockpiling law was enacted in 1946 and was not sufficiently supported until the summer of the Korean crisis.

"The Commission believes that the legislation under which the stockpile program is being carried out (the Strategic and Critical Materials Stockpiling Act, 1946 (60 Stat. 596)), is in general sound, and that in recent months it has been well administered.

"Experience with wartime materials problems widened public recognition of the need for stockpiling, and after the war ended the current comprehensive legislation was provided for acquiring and retaining strategic and critical materials for which the natural resources of the United States appear inadequate or insufficiently developed to supply defense needs. The law itself was fairly broad; early programs for carrying it out were not. Appropriations were limited and procurement action was not so vigorous as it might have been. In 1949, when supplies and prices of materials were generally favorable to building up the stocks, Congress cut $100 million from the year's contract authority, a reduction of more than 15 percent. In 1950 the outbreak of fighting in Korea was followed quickly by larger appropriations for stockpiling and a general strengthening of the program, but by that time prices had risen and private buyers and other governments were scrambling for supplies—a repetition of the failures of 1939. Since then the financial as well as legislative foundations of the United States stockpile have been strengthened, but the job is proving slower and more costly than if it had been begun sooner and pushed more vigorously in peaceful times.

"Some stockpiles are full, some contain virtually nothing; the others range all the way between these extremes. Averages are rather meaningless when applied to 74 specific materials, lack of any one of which might cause serious production trouble, but details of any particular stockpile could not be given in a public document without betraying to potential enemies our strengths and weaknesses. The general estimate is that at the end of March 1952 the total United States stockpile was one-third full. Compared to a proposed $9.1 billion stock (March 1952 prices), materials actually on hand at that date were valued at nearly $3.5 billion. In addition, about $2.2 billion worth had been ordered (March 1952).

"Stockpiles of materials cannot be built properly in a time of crisis. During the present emergency, materials demand has been so heavy that, for numbers of materials, the stockpiles could not be enlarged.

"The present policy of strong support for stockpiling must be vigorously carrid out in peace as well as in times of stress."

The Commission therefore recommends:

"That stockpiling of strategic and critical materials be made a permanent instrument of the national materials policy of the United States, and that the provision of adequate funds at all times for orderly purchases commensurate with possible emergency needs be a fixed and constant policy."

This recommendation is sound and is a general endorsement of our present stockpiling program.

The Commission suggests limitations on stockpiling as a security device. It says:

"On the other hand, stockpiling has its limitations as a security device, and there are potential dangers in its use. The fact that stockpiling can be done effectively only at certain times already has been mentioned. Other limitations

are physical: Some materials are perishable and can be stockpiled only through a system of rapid turnover; others, like iron ore, are bulky and very expensive for extensive stockpiling; petroleum and its product not only are bulky but also deteriorate and are expensive to store. Other security measures must be used for materials that cannot be stored safely and cheaply.

"One of the possible dangers in stockpiling is that possession of substantial stocks of critical materials might give rise to a Maginot Line kind of complacency, and thus deter industry and Government from vigorous efforts to develop new sources of supply, new techniques, or substitute materials. Another drawback is that producers might view the stockpile as a surplus overhanging the market and be loath to expand production. Still another is the possibility that United States stockpile purchasing might place strains upon the economies of friendly nations."

Most of these limitations have been anticipated in our present stockpiling law. The law provides for rotation of stocks, it provides for a frequent review of the stockpiling objectives and further provides that material in the stockpile is not to be released for civilian consumption. This prohibition insures that the stockpile does not act as a "surplus overhanging the market."

The Commission has stated above that the "United States stockpile purchasing might place strains upon the economies of the friendly nations." This statement, of course, refers to purchases for our stockpile since Korea. In view of the fact that this country has carried most of the load in Korea and has imposed severe limitations on its civilian economy, which were not adopted by many other countries in NATO, there is no legitimate basis for complaint that our program has placed such a strain on other nations. These complaints led to the International Materials Conference's recommendations which completely curtailed the stockpiling of materials such as copper, zinc, nickel, and cobalt. After the issue was raised in the Congress, the International Materials Conference allocations made some provision for strategic stockpiling.

No international body should be permitted to influence the timing of our stockpiling program. Should war come, the security of this Nation and of the nations who now criticize us may well depend upon the United States stockpile.

The Commission raises a number of other points in regard to the stockpiling program which are worthy of serious consideration. It says:

"Stockpiling has potential values for security that go beyond providing timely supplies of the specific materials stocked.

"When materials are stockpiled, other economic resources such as manpower, energy, and transportation are automatically stored with them as constituents of extracted and processed materials. The release of reserve materials in an emergency thus can lighten somewhat the pressure on the whole industrial machine. Stockpiling is as prudent for materials that are primarily domestic as for imports if wartime demand for them would expand faster than the country's capacity to produce them.

"This Commission believes that the stockpiling program of the United States is well conceived and that in general, though sometimes tardily, its statistical goals have been kept up to date in the light of current trends and possibilities. The choice of the critical materials on the stockpile list (74 at the beginning of 1952) represents careful statistical study and the judgment of qualified technologists, economists, and military experts in various branches of Government.

"The Commission feels, however, that three points need emphasis:

"First, in determining stockpile objectives, more weight should be given to the military vulnerability of production centers in the United States and other sources of supply in the Western Hemisphere. The Commission's studies indicate that full consideration is given to production trends and prospects, to the political friendliness and stability of governments of producing areas, to the prospects of some nations resisting invasion, to the vulnerability of transocean shipping lanes, and to a number of other factors. But in the past little weight seems to have been given to the possibility that some domestic production concentrations might be subject to damaging enemy attack, particularly by air. Similarly, the Commission feels that insufficient attention has been given to military vulnerability of other Western Hemisphere resources, particularly in North America.

"The Commission therefore recommends:

"That the vulnerability to enemy attack of the facilities for producing various materials within the United States and other Western Hemisphere countries be fully evaluated in estimating the amounts of materials to be stockpiled. The Munitions Board and the National Security Resources Board should decide whether or not doing this will require amending the Stockpiling Act."

There can be no question that in any future war this country may well be subjected to enemy air attack and the military vulnerability of our own production centers is a factor influencing stockpiling policy.

The Commission says:

"Second, the form in which materials are held in the stockpile is often of great significance and sometimes calls for nice judgments. Insofar as practicable, it is wise to store materials sufficiently processed for quick use, but excessive processing can waste materials and other resources. One experience of the Munitions Board illustrates the hazards of extreme fabrication: development of a new military watch made obsolete part of a stockpile of jeweled bearings.

"On the other hand, some materials in their raw state—bauxite, for instance—require so much further processing that their value in an emergency would be limited. Even so, there may be circumstances under which it is wise to stock them to some extent. Bauxite and aluminum are both on the stockpiling list—aluminum because of its value as a readily usable critical product, bauxite because it is more readily obtainable during the rearmament period and much cheaper, so that stockpile appropriations can stretch farther. The Commission says wisdom in this case in purchase of both the ore and metal.

"The general aim in stockpiling, however, should be to store materials in their highest homogeneous form—that is, a form permitting maximum flexibility in use to accommodate technological changes in industry, yet also representing as much processing as the requirement of flexibility will allow. The Commission believes that on the whole this objective has been kept in mind in administering the national stockpile program, and urges that it continue to receive great emphasis."

The above statement is constructive. Certainly the stockpiling of aluminum, where feasible, not only stockpiles the bauxite but also stockpiles the labor and the kilowatts necessary to reduce the bauxite to aluminum.

The Commission continues:

"Third, the periodic reviews of the objectives and purchase programs of the stockpile should be continued. Advances in technology not only can alter the desirable form of a stored product, but they also can bring a need for substitute materials, reduce old requirements, or even create demand for materials of very different properties. Development of new weapons and new tactical methods, changes in economic trends, in strategy and world political alinements also can change criteria. The objectives of the stockpile program have been overhauled twice since the program began in 1946. Regular annual reviews are planned for the future. For these reviews to be effective, military estimates of war requirements likewise must be kept fully up to date, and backed up by continuing review of individual stockpile objectives."

The Commission recommends:

"That annual reviews of the objectives and purchase programs of the stockpile, such as are now planned should, under no circumstances, be omitted or delayed and that they should be comprehensive, including consideration of effects of proposed stockpiling measures upon the economies of the United States and other free nations, and of whether techniques other than stockpiling or in conjunction with stockpiling could better promote the national security."

Once again the Commission shows undue concern regarding the effects of our stockpiling program upon the economies of other free nations. The Office of Defense Mobilization must carry out the mandate of the Congress as laid down in the stockpiling law without delay.

The Commission discusses the effect of the stockpiling program on the markets for materials. It says:

"By its very nature, a large-scale stockpile operation has a considerable impact on the general economy and on commodity markets. A times there may be pressures to use stockpiling purchases and sales as a stabilizing device.

"The Commission wishes to emphasize its conviction that such a perversion of the stockpile program to serve purely economic purposes no matter how inviting the possibility may appear, would be a grave mistake."

This is an excellent statement, but its execution would be difficult should the Commission's recommendations in chapter XV for buffer stocks be adopted. In fact, the Commission hedges this excellent statement with the following discussion which would open the way for other considerations than the national security to influence our stockpiling program. It says:

"There are other ways of gaining the same ends. The stockpile, when used exclusively for the purpose of building reserves against emergencies, is often the cheapest and most direct way of promoting security, as well as a method

that causes a minimum of interference with the private-enterprise system. It can be most effective if directed solely to its main purpose. If useful indirect benefits accrue from stockpiling, they should be incidental, and not a controlling factor in the operation.

"Under ideal conditions, buying materials for a stockpile would entail few problems, because purchases would be made at an orderly rate when supplies were plentiful and prices relatively low. Most of the current problems of stockpiling arise from the emergency pressure to fill quotas quickly despite high prices, heavy current demand, and the threat of war. Under these circumstances, stockpiling policy must take account not only of the level to which each stockpile has been filled and its strategic importance—which should be the only concern in setting priorities for purchases—but also of the effects of materials purchases upon rearmament, and upon economic conditions in the United States and among friendly nations."

The Commission once again decries the Buy American Act provisions in the stockpiling law. It says:

"Operations are complicated by a serious defect in the law itself: the 'Buy American' provision of the stockpiling act calls for giving preference to domestic producers of materials even at prices considerably above world markets. In chapter 14, the Commission recommends doing away with all 'Buy American' provisions and laws. Where stockpiling is concerned, the Commission finds the restriction not only incongruous but unnecessary and actually harmful.

"The 'Buy American' clause is incongruous because the chief purpose of stockpiling is to acquire materials that must be purchased abroad because the United States does not produce enough for military purposes, and in some cases produces none at all (up to December 31, 1951, more than three-fourths of all purchases and commitments were in imports, despite this clause).

"The 'Buy American' clause is unnecessary because support of domestic production, when essential, can be better accomplished by such other devices as subsidies and price premiums aimed directly at the materials where expansion or maintenance of production is desirable, whereas the clause operates without discrimination for all materials produced in this country regardless of whether or not it serves the ends of security.

"The 'Buy American' clause is harmful because, as long as this legislated pressure for domestic purchase exists, even at prices above world markets, the stockpile administration is not free to follow the sound economic policy of buying materials at the lowest price so as to achieve maximum security for minimum cost."

The Commission therefore recommends:

"That as a general rule stockpile acquisitions should be made at a minimum cost without favoritism to any producer, or group of producers.

"That the 'Buy American' provisions in the present stockpile act should be repealed."

The above discussion suggests subsidies and price premiums, in lieu of the "Buy American Act." Yet, on page 157, the Commission makes the unequivocal statement that:

"Granted that setting up the criteria for determining what is or is not 'secure' in a military sense can be difficult in the extreme, and that the security of any given source may alter with changing international conditions, the United States nevertheless should generally avoid, at least during the cold war, the high and continuing costs of such alternatives as subsidized domestic production."

If the Buy American Act creates a domestic industry in being which is available in the event of war, then it is difficult to condemn it as a public policy. Certainly the stockpiling program has not been hampered by the provisions of the "Buy American Act" since it has purchased materials abroad in order to attain its goals. On the contrary, it has been hampered by the quotas and allocations of the International Materials Conference which have established entitlements for the United States for the various materials necessary for our needs. This has prevented the attainment of the goals established for the stockpile and has further resulted in diversion of material under contract for the stockpile.

The Commission concludes with a good statement:

"Since stockpiles are built only to supply materials in security emergencies, it obviously defeats the entire purpose of the program to withdraw stocks unless such an emergency has arisen. There are only a few exceptions, all having to do with routine operations. Materials, of course, must be released if changes

in objectives make a stock excessive or if changes in technologies make a stock obsolete as in the case of watch jewels. Materials that cannot be kept indefinitely, such as natural rubber, have to be withdrawn regularly, but in such instances replacements should equal or exceed releases. Market stability—an essential to expanding materials production—is best maintained by confidence that no net stockpile releases will be allowed except in genuine security emergencies when actual shortages appear, and that excessive or obsolete stocks will be released gradually and with great caution.

"Under the present law nonroutine withdrawals from the stockpile require specific authorization of the President or, in some cases, approval of the Congress. The Commission sees no need for additional procedural safeguards, but believes that withdrawal policy should be applied rigidly and consistently.

"The Commission recommends:

"That no withdrawals from stockpiles, other than those necessary for routine operations, should be authorized except in a declared emergency when the national security clearly and emphatically requires release of the particular material."

This statement supports the fundamental philosophy of our present stockpiling law. It should not be changed under any circumstances.

CHAPTER XXX. PREPARING FOR EMERGENCY PRODUCTION

This chapter presents an interesting discussion of additional steps which should be taken to strengthen the defenses of the United States. The Commission states:

"Such a cushion can be built up by—

"Setting aside in the United States and its Territories, in-the-ground 'stockpiles' of mineral reserves, and providing in advance for corresponding extra processing and transportation capacity to bring them into speedy production.

"Developing and holding ready for use a 'stockpile' of technology which could be applied in emergency to below-commercial grades of ores.

"Developing additional sources of safe foreign supply in advance of the time they normally would be brought in by ordinary market forces.

"Such a production cushion requires balanced reserve capacity at three levels: The basic resources (minerals in the ground), processing facilities, and transportation. Extra capacity at any one level of supply will have far less value if not matched by others, particularly if expansion of the complementary levels would require a long time.

"For some minerals, like coal, known and developed reserves are so ample that they represent no bottleneck to expanded output. In other cases, such as copper and lead, industry ordinarily blocks out sufficient reserves only for a few years of normal production, but usually has a good idea of reserves than can be developed as needed. In other cases, like petroleum, exploration for new reserves must go on constantly; if the rate of discovery should decline, production would not be long in tapering off.

"Blocking out reserves and exploring for new reserves is costly, in time, manpower, equipment, and materials—all at a premium in war. It is therefore very much in the interest of national security to have larger than ordinary proved reserves available. The steel industry should have an abundance of stripped ore reserves; the petroleum industry should have ample semiproved and semideveloped pools so its drilling efforts will not be wasted on dry holes, and so its crude production can be held high and expended."

The Commission makes a rather unusual suggestion in respect to bauxite. It says:

"Bauxite presents a rather special problem. The United States is heavily dependent on imports of bauxite, which is vital to a war economy. Domestic bauxite reserves are dwindling fast, and with them a vital security cushion is disappearing.

"The Commission believes that ways should be found to hold down the rate of extraction of bauxite from domestic deposits to a level no higher than the current rate. The National Security Resources Board, in cooperation with other appropriate agencies of the Government, should study methods of accomplishing this and make its recommendations to Congress."

The aluminum producers themselves have aggressively developed bauxite sources in the Carribean. They are as desirous as anyone to protect their domestic deposits. This is another instance where the Commission believes that laws, rules, and restrictions are the solution to all problems. It is also another example of the Harry Dexter White philosophy.

The Commission makes another interesting suggestion with respect to manganese.

"Close study may show that there are cases where it will pay the Government to finance in advance of emergency the blocking out of ore reserves which are submarginal by present commercial standards. Manganese is probably such a case. Not only will this save time and manpower if war comes, but it will permit a closer estimate of emergency reserves, a matter of uncertainty for many materials."

This suggestion is certainly worthy of consideration.

The Commission recognizes that an abundant supply of material will not give this Nation security unless adequate processing facilities are also available. It says:

"It is not enough to have ore and oil in the ground: there must be facilities for extracting and processing them. During the Second World War the Government built hundreds of industrial plants, many of them to produce or process materials, but most of them to turn out military goods. After the war, the Government sold some of the most efficient materials capacity to private industry—aluminum, pig iron, and steel—to serve our expanding economy; some were dismantled, and some were placed in a 'mothball' status for emergency use. Since Korea, most of these reserve plants have been reactivated and are beginning to turn out large quantities of synthetic rubber, aluminum, magnesium, and other materials.

"The Commission has made no attempt to appraise the adequacy of these measures for the current emergency, but it is in full accord with the principle of such measures and regards them as necessary steps toward expanding materials capacity in the interest of security.

"The building of standby capacity is usually a costly method of assuring extra supply for defense, but in a limited number of cases it is the only means of achieving sufficient preparedness. In emergencies, production can be expanded much more rapidly in fabricating industries than in extractive industries. Fabricating plants do not, as a rule, operate on a 24-hour basis, but many kinds of materials are processed in plants which normally operate around the clock—for example, iron and steel. Therefore, to obtain an adequate reserve capacity for materials production, it is usually necessary either to overbuild and operate below rated capacity or to keep extra plants in 'mothballs'—a costly but sometimes necessary insurance for national security.

"In most cases, larger reserves and capacity created as a war standby will eventually be usable even in normal times as demand grows. The policy proposed, actually means, therefore, that the United States would be expanding capacity faster than would normally be called for in order to establish a standby cushion for emergency use."

One of the Nation's greatest assets lies in the fact that an existing plant producing civilian goods and capable of conversion for war production includes a trained labor force and the facilities for housing and serving these people. Actually, the homes, churches, schools, and utilities which already serve these people will be a great asset with a far higher monetary value than the industrial plant itself. When new plants are built and new communities are created under emergency conditions, these facilities must all be duplicated at a tremendous cost. The Atomic Energy Commission has already had a great deal of experience with the construction of such communities at Oak Ridge, Savannah River, and in other locations. The development of dual purpose plants which will use the existing personnel and community facilities on a combined operations basis should be an important part of any overall policy for military security.

The Commission recommends standby technology which it discusses as follows:

"An additional form of reserve capacity which merits careful attention is the 'stockpiling' of technological methods for producing substitutes or materials from the low-grade reserves or otherwise increasing the availability of materials which ordinarily would not be economically feasible, but which might be needed in time of great emergency. Many devices known to technology fall in this class. An important example is the technology for extracting oil from shale. In chapter 17, the Commission recommends early construction of small commercial-scale plants so as to have more complete experience with the processes and costs of this method for augmenting supply. The Nation's security position would be strengthened by fostering similar technological advances in methods for producing aluminum from clays, and for contriving synthetic or other substitutes for such imported critical materials as high-grade mica, quartz crystals, industrial diamonds, asbestos, tin, and lead.

"The Commission believes that a full store of such technologies, ready to be put to use, should be systematically compiled for possible future need. Again this will usually mean pushing forward with a technical development somewhat in advance of the time when normal market forces would bring it about."

The comments on previous chapters indicate that much more could be accomplished through intensive research than through the construction of commercial size plants which would involve large subsidies at the taxpayers' expense. If our stockpiling goals are set correctly and we have an opportunity to complete the stockpiling program, such a procedure should not be necessary.

The Commission stresses that extra transportation capacity is another requirement for adequate defense. It says:

"A moderate expansion of the Nation's transportation system is underway to meet the needs of the current mobilization program—a step important to achieving an adequate flow of materials especially in such bulk items as coal, iron ore, and petroleum. For instance, during 1952, the freight-car fleet is expected to be increased by about 30,000 cars, diesel locomotives by about 2,000, and highways extended about 12,000 miles. Some 52 tankers, 35 large Mariner class dry-cargo vessels, and 14 ore carriers for the Great Lakes fleet are under construction in American shipyards. These are all steps in the right direction, but careful study should be made by the Government to determine what additional expansion is required for adequate materials supply in the event of war."

The Commission makes one final recommendation in connection with adequate transportation. It says:

"The Commission has noted one serious omission in long-term provisions for meeting the transportation needs of national security—development of the St. Lawrence seaway project. This seaway not only will greatly reduce the distance for shipping iron ore from the new rich deposits in Labrador to the United States inland industrial defense triangle, but this will provide a safe route. The present ocean lanes are exposed to the danger of submarine attacks. In chapter 20, the Commission makes its broad recommendation in the interest of expanding the Nation's energy supply for the early development of a number of major hydroelectric projects. This includes the St. Lawrence project which thus would provide energy as well as safe, efficient transportation."

The Commission recommends:

"That development of the St. Lawrence seaway be initiated in the near future for transportation purposes. A strong economic case exists for the development of the St. Lawrence seaway and the stream's power potentialities, even without regard to national security, but the security aspects of the project make it overwhelmingly expedient to proceed with its development as early as possible."

PREPARING FOR FUTURE POLICY

CHAPTER XXXI. THE CONTINUING TASK

The Commission makes two recommendations for the future. These recommendations are:

"That each agency of the Government concerned with primary data on materials and energy strengthen its own fact-gathering, analytical, and programing machinery so that the Government's total efforts in this field will be adequate as a basis for estimating the total materials problem and that special attention be paid to the need for more and better economic analysis.

"That the National Security Resources Board be directed, and provided with adequate funds, to collect in one place the facts, analyses, and program plans of other agencies on materials and energy problems and related technological and special security problems, to evaluate materials programs and policies in all these fields; to recommend appropriate action for the guidance of the President, the Congress, and the executive agencies; and to report annually to the President on the long-term outlook for materials with emphasis on significant new problems that emerge, major changes in outlook, and modifications of policy or program that appear necessary. To the fullest extent consistent with national security, such reports should be made public."

It appears that the Office of Defense Mobilization is already effectively implementing these recommendations.

VOLUME II

HOW THIS VOLUME WAS PREPARED

The basis for the projections of volume II, which in turn supplied the source material for the Commission's conclusion as given in volume I, was the Projection of 1975 Materials Demand, by Arnold C. Harberger of the Johns Hopkins University faculty. It should be pointed out that Professor Harberger was born in 1924 which would indicate he was 28 years old when the study was published.

The individuals responsible for the detailed commodity studies are as follows: Sidney S. Alexander, Alfred S. Cleveland, David W. Lusher, Allan F. Matthews, Samuel G. Lasky, Clair Wilcox, William Parker, Bruce C. Netschert, Donor M. Lion, Cornelius Cosman, Glenn A. Lehmann, Vivian Eberle Spencer, Nathaniel M. Elias, Frank L. Fisher, W. Scott Payne, Samuel Moment, Paul W. McGann, Harry Kahn, Alexis B. Tatistcheff, John Croston, Alan M. Bateman, Charles A. R. Wardwell.

Their professional competence has been indicated in an earlier section of this study.

Chapter 22, by Professor Harberger, develops the requirements for material in 1975 based on the working population and its productivity and a projection of major end-use requirements. This chapter not only develops these requirements for the United States but attempts a similar development for all the free nations.

Chapter 23 was prepared by the Geological Survey and the Bureau of Mines of the Department of the Interior. It attempts to develop an estimate of the reserves that will exist in the year 1975 for each of the commodities covered in chapters 2 through 21.

The commodity chapters, in general, review the current supply and demand relationships for each material within the United States. They then project 1975 requirements and estimate domestic resources. The difference supplies the amount of material which must be derived from imports. Each chapter then reviews the ability of the remainder of the free world to supply the estimated imports while maintaining supplies for other nations at the projected 1975 rate. Special consideration is given to the security aspects of each material.

It is obvious that any projections based on a multiplicity of estimates such as are contained in these chapters can, at best, be only a very tentative answer to the 1975 supply-demand relationship.

CHAPTER 1. SCOPE AND PLAN OF STUDIES

This chapter sets forth the basic assumptions on which these specific commodity studies were made. In projecting demand, the following assumptions were made: Productivity and population will grow at specified rates. International tension will continue but a third world war will be prevented. High employment and economic prosperity will prevail in the free countries.

These assumptions cover a great deal of territory, particularly assumptions on population growth and productivity gains. A further assumption is made, namely, that account shall be taken only of those technological developments whose applications are currently foreseeable in the early 1950's. This assumption is already obsolete and renders all projections based on it rather meaningless.

In estimating demand, it is assumed that raw materials will be freely available at approximately the same prices in relative terms as in 1950. This assumption, likewise, is not warranted.

In estimating supply, the assumption is made that many of our resources will prove inadequate regardless of price. In discussing lead, on page 5, the report says:

"Output of lead has not only failed to keep pace with growing demand but has actually fallen in recent decades, and threatens to remain low in spite of high prices and a strong demand"

The statement already has been proved erroneous; in fact, the principal worry of lead producers is what to do with their excessive supplies. On page 7, the Commission states:

"The supply projections take account only of those technological changes where feasibility has been reasonably estiblished."

Since this report was submitted, important new technological developments have been reported which show promise of locating ore bodies hitherto beyond the prospector's reach. A New York Times article dated February 21, 1954, reports one of these developments which was revealed before the American Institute of Mining and Metallurgical Engineers at its meeting in January 1954. This account is included in this section.

The Commission, on page 69, showed that the definition of an ore body and of proved reserves is very flexible. It said:

"Moreover, as ore bodies are mined they frequently prove to be larger than originally estimated. Thus United States reserves averaging 50 percent alumina are now estimated to be 5 million tons larger than in 1945, although more than 8 million tons have since been mined. Likewise the reserves in Dutch and British Guiana are now estimated to be larger than they were believed to be in 1945. The definition of reserves is subject to some elasticity as process improvements occur. Thus, ore high in silica (13 percent) was uneconomical in 1939 but was almost as economical as low-silica ore (7 percent or less) in 1946 because of the development of the modified Bayer process. This technological improvement, accompanied during the Second World War by the construction of capacity to handle the high-silica ore, effectively increased economic domestic reserves from about 7 million metric tons in 1945 to about 40 million tons of higher silica ore in 1951. These reserves will now yield nearly as much alumina per ton as the ores having a much lower percentage of silica."

While the Commission suggests that we should place an increasing dependence on foreign supplies, it must be quite obvious that our foreign suppliers may choose to stop shipments to the United States under wartime conditions. Even though our Navy could keep the sea lanes open, there is no assurance that India would be a willing supplier of manganese, ilmenite, or beryllium. In fact, no shipments of beryllium were received from India, according to the Commission, from 1946 through 1949. Under these conditions, it seems unwise to place too great a reliance on foreign countries for strategic materials.

The Commission shows in the conclusion of this chapter that its primary thesis is that the United States has become a have-not nation, and that in the future we shall become increasingly dependent on imports. It said:

"Projected levels of demand, compared with prospective supplies, indicate that the United States will become increasingly dependent on foreign sources of supply for most major materials. The Commission has made recommendations in volume I directed at maintaining domestic production at the highest level commensurate with lowest cost. But even full success in this effort will find the United States less able in the future to supply the volume of materials that it requires for growth and security. It becomes evident therefore that policy must, among other things, concentrate heavily upon the stimulation of foreign as well as domestic supply. Recommendations for accomplishing this are made in the first volume of the report. With increased dependence on foreign supplies in view, policy must likewise concentrate upon meeting the greater security problems which this situation generates. Recommendations for general policy, and for special problems of particular materials, are made in volume I.

"Since these studies concentrate on the problems, and because policy naturally dictates that the most difficult areas should receive greater attention, the outlook for key materials presented here may have a somber tone. There can be no blinking the fact that the United States and the free nations face a more difficult supply situation in the future than in the past. The Commission believes that no insurmountable obstacles exist to ample and secure supplies for all the free world, but that a vigorous and creative attack upon the problems is necessary in order to meet the demands that are anticipated in these studies."

The Commission stresses that the only solution lies in the recommendations for general policy contained in volume I. These recommendations include international commodity agreements.

[From the New York Times, February 21, 1954]

Geophysics Finds Hidden Ore Bodies

THREE ULTRAMODERN PROSPECTORS TELL HOW ELECTRONIC TOOLS LOCATED COPPER MINE

(By Jack R. Ryan)

Geophysicists have made considerable progress in developing ways to ferret out strategic ores deeply hidden under the earth, gravel, and rock.

But their progress, increasingly important as the Nation's producing ore bodies dwindle, does not appear to have attracted the attention it deserves except in professional circles. And even there it is often soft-pedaled because company exploration programs are highly competitive and usually are conducted with as little fanfare as possible.

Last week the American Institute of Mining and Metallurgical Engineers heard at its meeting here the first detailed report of a project which aptly illustrates what modern geophysical prospecting can do. It was the story of a contract exploration group that set out to demonstrate how to find a hidden copper-ore body—and ended up in the copper-mining business.

The concern is the United Geophysical Co., one of the leading organizations hired by major petroleum companies to search for oil. Its founder (in 1935) and present chairman is Herbert Hoover, Jr., who is serving as the State Department's special consultant in efforts to settle the oil deadlock between Iran and Britain.

SEARCH BEGAN IN LIBRARY

United Geophysical had done intermittent work for mining companies, but by and large had found them cool to the idea of contracting on a large scale for geophysical prospecting. So the demonstration was planned and put under the direction of two young engineers, Robert E. Thurmond and Walter E. Henrichs, Jr. These two, with United Geophysical's manager of mining exploration and production, E. D. Spaulding, described the results in a technical paper and gave additional details later in an interview.

They began their prospecting project with a library research of 30 areas where there was surface evidence of ore deposits and where geological literature indicated promise of hidden mineralization.

Field inspection trips and published data led them to concentrate on the Mineral Hill area of Pima County, Ariz., about 20 miles southwest of Tucson—an area of cactus and dry-wash gulches. The district had a history of sporadic copper, lead, zinc, silver, gold, and molybdenum mining.

They started with magnetometers—instruments which measure the intensity and direction of the earth's magnetic field, which is affected by various types of mineralization.

Next they made an electromagnetic survey, setting up their own localized electromagnetic fields for the same purpose.

Gravity meter experiments followed using instruments which measure changes as slight as a few billionths of a pound in the gravity pull of various subsurface compositions. Then came resistivity tests which gage the electrical current-carrying properties of underground formations, followed by spontaneous polarization readings of the batterylike effects caused by some types of ore deposits.

Correlation of the data obtained from these prospecting methods indicated an ore body whose upper end was about 200 feet below the surface of the desert, and which dipped steeply to the south. Diamond drilling began, to determine the size of the ore body and its economic potential.

Results led to the incorporation of the Pima Mining Co. as a wholly owned subsidiary of the United Geophysical Co. A mine shaft was sunk—first to the 400-foot level and then, as all signs continued promising, on down to the 600-foot level. Lateral exploration drifts, or horizontal tunnels, on four levels now total more than a mile in length and are being extended.

In the course of this exploration, the Pima mine has shipped about 40,000 tons of ore containing some 4 million pounds of copper. The ore grade averaged just under 6 percent, the engineers said, which is just about as good as United States ore comes today.

The Pima Mining Co. is continuing its exploration program, no longer as a demonstration but to develop the new property into a long-lived, profitable copper producer.

Conservative, independent authorities at the meeting last week called the mine a major nonferrous metal discovery by geophysics.

There are about a dozen other companies doing contract geophysical exploration work in this country, and this type of prospecting, with many variations, is even more widely used in Canada. It is credited with the recent discovery of a large base metal deposit in a New Brunswick area, which has not heretofore been a notable metal producer.

FERROUS METALS—CHAPTER 2.

IRON AND STEEL

In discussing the highlights of the iron and steel situation, the Commission discusses the availability of scrap. It says: "The price of scrap is subject to sharp fluctuations, but price instability does not prevent the scrap trade from collecting, preparing, and selling scrap. Public programs of market stabilization are not required."

This statement is significant in view of the thesis presented in volume I on page 136 that "* * * our arrangements as a Nation for recycling scrap and returning it to the materials stream are appallingly negligent. One chemist, pointing out that 'when a few ounces of metal are worn from the motor and running gear (of an automobile) the machine is pronounced unfit and discarded,' has gone on to add, 'I should think the automobile manufacturer would want to lend the metal content of a car to the purchaser on a deposit basis, rather than sell it outright and rely upon the haphazard junking system to return part of it as scrap.'"

The Commission suggests that "the Government should assist the industry in its efforts to add to the supply by conducting salvage drives, by checking exports, and by repatriating military scrap from areas where it is not needed to feed the furnaces of other nations of the free world."

The Government could make a real contribution in promoting repatriation of military scrap.

The Commission states that freedom of entry for new firms in the iron and steel industry should be safeguarded through public policy. This is a sound recommendation provided it is not interpreted as an attack on the large firms with a view toward atomizing the industry.

The Commission also says:

"The establishment of small-scale enterprises, embodying recent advances in technology, should be encouraged where such operations promise to be economically sound. * * *

"The past orientation of technology in the steel industry has been toward operation on an increasing scale, involving a heavy investment in productive facilities. Today, an integrated plant (with coke-fueled blast furnaces each producing 1,500 tons of pig iron per day, with a battery of open-hearth furnaces each producing up to 500 tons of steel, and with a continuous rolling mill) could not be built for much less than $250 million. A significant consequence of recent advances in technology may conceivably be the emergence of enterprises conducting integrated operations on a much smaller scale. The utilization of local deposits of ore in the direct reduction of iron or in the production of pig iron in the electric furnace or in the low-shaft blast furnace, the utilization of local supplies of iron and local surpluses of scrap in the production of steel in the electric furnace or in the turbohearth, the continuous casting of semifinished steel, and the finishing of steel in small mills—all of these operations are feasible and all of them can be undertaken with an investment much smaller than that required for production on a larger scale. The great bulk of steel products will continue to come, undoubtedly, from the larger plants. But, taken together, these developments in technology may well provide the basis for a number of new establishments, turning out special products for local markets, each of them conducting continuously integrated operations on a small scale, and all of them contributing significantly to the supply of steel."

If a process is economically sound, no encouragement by Government should be necessary. The iron and steel industry is still an industry in which the smallest economical unit must be very large. This is particularly so if it is to manufacture a reasonably full line of finished steel products. Small firms have entered the industry where special advantages were present, such as the availability of scrap or the proximity to a market for a limited line of finished steel products. Provided the freedom of entry is preserved, no special action need be taken to

encourage the establishment of small-scale enterprises in the iron and steel industry.

The Commission believes that the necessary expansion of the steel industry will take place:

"Whether private expansion, without public encouragement or participation, will be undertaken at the rate required in future years, will depend upon business judgment as to prospective demand, prices, and profits. With respect to demand, the industry has recently raised its sights. With respect to prices, it finds itself in the center of political controversy. With respect to profits, it observes that the rate of return in steel, over the years, has been well below that enjoyed by other major industries. Expansion has nonetheless occurred, through the growth of established firms, with and without assistance from the Government, financed predominantly by the reinvestment of earnings. Expansion through the entry of new firms has been obstructed by the scale of production required for efficient operation and by the difficulties encountered in obtaining capital. The first of these obstacles may be reduced, as has been seen, by changes in technology. The second has been overcome in some cases by public aid.

"Expansion of capacity has been promoted by Government in three ways: By granting loans, by permitting accelerated amortization under corporate income and excess-profits tax laws, and by building facilities at public expense. More than $200 million of the loans granted by the Reconstruction Finance Corporation from 1940 to 1950 went to 36 steel concerns. Half of the capacity constructed immediately before and during the war was built by the industry under provisions of the Second Revenue Act of 1940, permitting 5-year amortization of the cost of new facilities. The other half was built by the Government. When the Government-owned properties were liquidated after the war, 116 units constructed at a cost of $750 million were sold to members of the industry for 260 million or about 35 cents on the dollar. Accelerated amortization was again permitted under the Revenue Act of 1950. Applications for tax certificates under this law, through the first half of 1951, covered an investment of nearly $4 billion in capacity for making iron and steel, and certificates issued on some 200 projects permitted 1.7 billion, or 71 percent, of a total investment of 2.4 billion to be written off in 5 years. This experience has made it clear that satisfaction of future requirements need not be prevented by a shortage of productive capacity. Additions to capacity will be made, without assistance from Government, by the industry itself. If less than adequate, they can be encouraged by public loans and by accelerated amortization. And, in an emergency, they can be assured by public construction. The question is not whether ample facilities will be provided, but how."

The Commission admits the steel industry finds itself in a center of political controversy in respect to prices. The Commission could have performed a real service if it had urged a more realistic approach to the pricing problem. If the steel industry were to charge a higher price for steel, the Commission would not have had to say: "And, in an emergency, they can be assured by public construction. The question is not whether ample facilities will be provided, but how."

The Commission discusses the security problems surrounding iron and steel. It shows that steel-making facilities are becoming more decentralized and it says: "This movement may well be accelerated by limitations on freight absorption and by increasing reliance on imported ores."

Security considerations do not warrant the prohibition of freight absorption which is implied in the above statement. The Commission says:

"The real threat to national security lies in the fact that hostile action might seriously curtail the movement of ore. Deliveries from overseas could be halted by submarines. Six of the eight boats carrying ore from Chile were sunk and the other two withdrawn from service in the first weeks after America entered the Second World War. With overseas supplies cut off, ore would have to be drawn exclusively from sources within the continent.

"Open-pit and underground production in the Lake Superior region might be stepped up. But the supply of iron obtained from taconite would be limited by the capacity of the beneficiation plants. The great bulk of these materials, moreover, would have to pass through the locks of Sault Ste. Marie, where a single explosion could interrupt the flow. Alternative movement of any significant portion of the Lake Superior output by rail would be exceedingly difficult.

"Supplies from this region could be assured by various measures. Standby plants could be constructed for the processing of taconite; rail facilities could

be provided to haul ore from Lake Superior to Escanaba on Lake Michigan; or standby equipment could be installed to unload it above the canal, haul it past the locks by rail or by conveyor belt, and reload it at the lower end. Such facilities would be costly, and the Lake Superior region alone might be unable to offset the deficit occasioned by the loss of ore from overseas."

The Commission's concern with our dependence on an overseas supply of iron ore is noteworthy. It is difficult to understand the Commission's desire to foster United States dependence on distant supplies of other materials which are just as critical as iron ore. It urges the construction of the St. Lawrence seaway in order to facilitate the movement of Labrador ore. The Commission has given convincing proof in this discussion of the necessity for fostering domestic sources of supply to protect United States security.

Difficulties in making projections for the year 1975 are clearly shown in reviewing the scrap situation in 1954—less than 2 years after this report was issued. The President's Materials Policy Commission said:

"Accordingly," the supply of obsolete scrap, running around 22 million net tons in 1950, will be little larger in the years immediately ahead. The share of scrap in the metallic materials fed to furnaces will, therefore, decline and the share of pig iron will have to rise. This will require a corresponding increase in the supply of iron ore, coke, and limestone. And it will necessitate a substantial addition to investment in facilities for mining, preparing, and transporting ore, coke ovens, and in blast furnaces."

By March of 1954 the Senate Small Business Committee was investigating why the price of scrap had fallen from $44 a ton to $23 during a period of 10 months. The scrap industry representatives complained to the committee that "one of their chief problems has arisen through increasing use of expensive pig iron relative to scrap iron in open hearth operations." Obviously, the steel industry would not be using expensive pig iron rather than scrap if it actually added to their costs. The industry has new blast furnaces in operation which it would be expensive to close. The extra capacity was built largely at the request of the Government. The present plight of the scrap industry is another indication of the problems which arise when Government control, rather than market forces, determines the operating practices of industry.

The Commission reviews the possibilities of stockpiling ore and scrap but it believes that such procedures would not be practicable. It then says:

"A better case can be made for stockpiling pig iron. It would require less space than ore. It would oxidize less readily than scrap. And if it could be produced and stored in periods when the output of steel was low, coke-oven and blast-furnace production could be stabilized and emergency expansion in the output of steel would not be held within the limits established by pig-making capacity and the availability of scrap. An adequate stockpile of pig iron could keep steel furnaces going while mining operations were being expanded, beneficiation plants constructed, sunken ore carriers replaced, or damaged transport facilities repaired.

"It is to be assumed, however, that funds available for stockpiling will be limited. It would, therefore, be wise, instead of investing heavily in iron ore, scrap, or pig iron, to emphasize the acquisition of materials essential to steel production that must be imported principally from overseas: Manganese, chromium, tungsten, and other additive metals."

The stockpiling of pig iron would be an extremely expensive step and, in view of the vast quantities of materials required, does not appear practical.

While the Commission so frequently urges that industry rely on overseas sources, it recognizes the threat to national security which such reliance implies. If there is a danger in bringing iron ore from Labrador and Venezuela, the danger is far greater in becoming dependent on manganese from India.

The Commission says: "The United States should continue to use its influence to encourage the adoption and development of the program embodied in the Schuman plan and to preserve the spirit of nonrestrictive cooperation expressed in the stated objectives of the plan."

There has been no discussion in the text which would support this recommendation. Clarence B. Randall, president of the Inland Steel Co., who was steel consultant to Paul G. Hoffman during the first year of ECA, reviewed the Schuman plan in the October 1951 Atlantic Monthly. Mr. Randall showed that while the economic unification of Europe is the first step in obtaining political unity, he did not believe that this should be done by destroying incentive and placing competition in fetters. Some excerpts from Mr. Randall's article follow:

"The more noble the ideal the more important it is that the right method of achieving it be chosen. The difficulty about noble ideals is that men pursue them under such deep emotion that they do not evaluate the consequences of their acts. And so it might be with the Schuman plan. If a magnificent gesture toward political unity should destroy incentive and fetter initiative in the basic steel industry to the point where its further progress was retarded instead of advanced, the Schuman plan might prove to have been the wrong approach to the ideal.

"At no time during the 11 months of day-and-night bargaining among the governments, and in no country, were the steelmen admitted to the council table except for a few matters of technical detail. Their advice was not asked and they were given no orderly chance to be heard. Yet, theirs was the stake. They and their fathers and grandfathers had built the plants stone by stone and beam by beam, and had borne the destruction of three wars, but they were dealt with merely as statistics in this new international adventure. The whole approach to the plan was that private ownership and interests must at all times be strictly subordinated to the broad political and social aspects of the new community. It was hoped that the owners would not suffer too much, but there were to be no inhibitions about it.

"This being true, the industrialists have passed from initial skepticism into the present state of deep apprehension or vigorous opposition. Steel is still the stronghold of private enterprise on the continent. Except for the accident of a minority interest in one French plant which is presently owned by the state, and some recent Government aid to the Dutch plant, neither of which reduces the autonomy of direct private management, no industry anywhere has a more vigorous history of development through the investment of private funds and the exercise of private initiative. Under the wartime controls which survived the cessation of hostilities, the steelmasters have been extremely restive. Now, with the treaty signed by the Foreign Ministers, they await the inevitable approval by the several parliaments this fall and early winter as men would await the summons to the guillotine.

"So what should an American think about it all? Obviously, it isn't honest just to duck the whole thing and not have an opinion, and yet who in the United States has one? The official party line of our Government as expressed by the State Department and by ECA is to be for the Schuman plan, on the broad, general ground that European unity is desirable. We were firm against the cartel idea, but whether the overall impact of the plan will be a move toward socialism and away from free enterprise is treated with silence by our officials. There is no volume of informed opinion in this country to which our Government may turn for guidance. We debate the Far East and the Middle East and military defense of Western Europe on every forum and in every pullman car, but never a word about the Schuman plan.

"For myself, I have come to the conclusion that the risks are too great. I cannot believe that it is fair that the European steel industry, which has been built by the patience and skill of generations of steelmasters, maîtres de forges, from its beginning in the Middle Ages to its present strong position, which is so basic to the prosperity of each country that is involved and so essential to our own plans for European rearmament, should be made the subject of a vast sociological experiment. I would be the first to admit that the European steel enterprises are not perfect: They are not yet fully modernized; they have been too slow to raise wages and improve working conditions; and they shrink from the risks of that honest competition which is so vital to our own free economy. But this remedy is too violent. It destroys more than it corrects.

"I therefore share the fears of those who believe that the Schuman plan will weaken Europe by laying the dead hand of socialism and bureaucracy across its basic industry. I wish fervently that somehow some other way might be found for advancing the political unity of Europe.

"Yet in all conscience how could any thoughtful person drop this important subject on that negative note? World problems cry out urgently for solution. Western Europe is their focus, and the Schuman plan by its boldness and its honesty of purpose evoked an emotional response from the weary nations of Europe upon which peace can and should be based. Mr. Schuman's declaration was brilliant and right in its spiritual concept. I applauded it a year ago and I applaud it now. It is the treaty that is wrong. It is the men who have done the compromising who have let Mr. Schuman down and who have locked into the document doubts like mine.

"This came about because the treaty is the work of men who were half-hearted in their convictions about free enterprise. From every country they were government officials, men who by instinct and habit of mind favor the ascendancy of bureaucracy over business. Taboo at the conferences were the men whose lives have been devoted to the concept that the greatest good for the greatest number is brought about by full release of the driving force of private initiative. Taboo for that matter were American steel men in forming the American policy.

"Yet the steel industries of the countries involved are already an important force in the world. Great wars were begun in reliance upon them, and in peace they have contributed mightily to the economic strength of Europe. Governments did not bring this to pass, steel is not produced in Paris, or Rome, or Brussels, and never will be. Ingots are not rolled by bureaucrats. Why then should not the men who have made the present system work have a chance to be heard? Is it reasonable to suppose that the men who drew this treaty can make more and better steel than they? Is this a time for that sort of revolutionary gamble?

"Fortunately, there is still time to do something about it. True the Foreign Ministers have initialed the draft, but in each country, parliamentary ratification will be required. Amendment is not only still possible, but normal. No one doubts the propriety of full public discussion in each country, to be followed by appropriate modification where that seems to be required. The question still to be answered by the nations of Europe is whether they believe that free enterprise should be preserved, and by us whether the United States, where that system has produced the economic strength that is now the salvation of the world, will use its great influence in that direction.

"What specifically do I think should be done?

"Let them write into the document a declaration against socialization as clear as that against price fixing. Let there be a free-enterprise standard for measuring the conduct of the administrators. Strike out the punitive measures and rely on informed public opinion to govern the social attitudes of the managements. If necessary, reduce the term of the commitment, making it long enough for a fair trial but not the equivalent of forever.

"In other words, to resolve the dilemma, let M. Schuman's ideal find expression in a climate of free enterprise, in language drawn by men who understand free enterprise and believe in its power for good."

Mr. Randall's warning would suggest great caution before we agree to support the Schuman plan.

The Commission says:

"The United States, in the administration of present programs for extending financial aid to underdeveloped areas, should encourage expansion of capacity for the production of iron and steel in these areas where available resources and potential markets provide a sound basis for the industry. It should also be prepared to give sympathetic consideration to requests for aid from countries where operations can be established, on a small scale, with reasonable economy."

This is another recommendation where the possibilities of spending the taxpayer's dollars are unlimited. A time may come when United States iron and steel producers may be faced with severe competition from the new and up-to-date facilities which have been donated by the United States taxpayers to their competitors in other countries. If the Commission's recommendations to lower tariff barriers are to be taken seriously, we must make sure that we are not subsidizing the foreign competitors of the United States steel industry.

FERROUS METALS—CHAPTER 3

MANGANESE

The Commission shows that the free world can obtain ample manganese provided that trade relations and overseas shipping are maintained with India, Africa, and Brazil. A problem is presented in that Russia is the largest producer of manganese and, should the Soviet Union decide to resume shipments to the free world, there would be price pressures on marginal producers elsewhere. The Commission recommends that:

"In view of the potentially disruptive influence of Soviet manganese production, long-term development and purchase contracts would be particularly desirable."

Here again the Commission suggests direct subsidies at the expense of the taxpayer for foreign producers.

Manganese presents a security problem which the Commission discusses as follows:

"Under normal trading conditions there are obviously no strong commercial incentives to develop high-cost sources of manganese. In the event of war it is quite possible that the United States might be substantially cut off from present sources, which now supply about 90 percent of total consumption. Security considerations therefore indicate the necessity of developing peacetime programs to insure against this danger, without disturbing normal trade relations or moving to more costly sources or methods of utilization before these steps are required.

"In addition to stockpiling, an adequate security program for manganese requires ability to fall back on domestic resources in the event of war. The major possibilities include recovery from waste products and utilization of low-grade domestic ores. Economies in use would help."

The Commission gave no consideration to the use of tariffs as a means of developing domestic manganese production.

There, of course, is never a security problem under normal trading conditions, which implies an absence of war. Inasmuch as our manganese supplies are obtained from India and Africa, with long exposed sealanes, the security problem is of paramount importance. Furthermore, the present Government of India has shown a willingness to embargo the shipment of critical materials to the United States under peacetime conditions. Its political orientation is certainly not a foregone conclusion, should a war develop between the East and the West. Under these conditions, the Security problems in manganese are paramount. The quotation above recognizes the danger but provides no feasible solution.

This chapter also makes the following statement:

"The reduction of manganese content in most steel specifications might cut consumption by over 10 percent without seriously affecting the quality of carbon steels."

This is an amazing statement, inasmuch as manganese does not enter into the steel itself and steel specifications are not involved. Manganese is used as a desulfurizer and deoxidizer, and no conceivable changes in specifications could affect manganese usage. In fact, the author of the discussion of manganese, on page 125 of this volume, was apparently not consulted by the author of the above quotation. Page 125 says:

"The use of manganese in steelmaking is technically determined; it requires about 13 pounds of manganese to make a ton of crude steel."

The Commission realizes the necessity for developing our own resources. It closes with the following statements which provide the only feasible solution to the problem:

"But wartime manganese requirements obviously cannot be met through conservation alone. If imports were seriously reduced in wartime, utilization of low-grade domestic reserves would be required to fill the gap as the national stockpile was drawn down. A potential wartime source is the basic open-

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hearth slag, which, as already described, contains considerable manganese. Except for its high phosphorus content, the slag resembles many large low-grade manganiferous iron ores. Several processes for extracting manganese from these slags have been developed and one or more seem to be on the point of industrial feasibility; full recovery of the manganese would yield almost 75 percent of all the manganese required for steelmaking.

"The recovery of manganese from low-grade ores is also feasible and might prove to be cheaper than recovery from slag. The use of both slag and low-grade ores would be simplified if the manganese could be introduced into the steel in the form of spiegeleisen or silicomanganese (alloys containing less than the 70 percent manganese content of ferromanganese).

"Some of these proposed wartime measures may prove to be commercially profitable even under normal peacetime conditions. Conservation of high-grade ore, recovery from flue dust, and the use of ferromanganese substitutes are especially to be recommended."

A tariff might be one of the easiest ways to meet this problem, particularly if it were combined with a quota so that domestic producers would be assured a market for their high-cost managanese without expensive subsidies to the taxpayer.

FERROUS METALS—CHAPTER 4

THE ADDITIVE METALS

The additive metals included in this chapter are chromium, nickel, molybdenum, cobalt, tungsten, vanadium, and columbium.

The theme of this chapter is shown in the following quotations from the Commission's report:

"International competition in obtaining the additive metals in periods of scarcity might lead to maldistribution inimical to free world securty. The present polcy of effecting an equitable allocation through international agreement should be adhered to during periods of scarcity."

The preceding paragraph refers to allocations by the International Materials Conference. The Commission appears willing to sacrifice the market mechanism and accept international allocations. No criteria are furnished to clarify the meaning of the phrases "maldistribution inimical to free world security" and "equitable allocation." These phrases can mean whatever the representatives of governments on the International Materials Conference want them to mean.

It is significant that of the 7 materials considered in this chapter, 4—nickel, molybdenum, cobalt, and tungsten—were allocated by the International Materials Conference.

The Commission realizes that our stockpile is one of the most important means of meeting emergency demands for these critical additive metals. It says:

"A more serious problem is presented by the probability that the supply of some of these metals will not be adequate in time of war even though overseas supplies are not cut off. To meet this situation our Government has created a national stockpile that includes the additive metals. As in other commodities, the stockpile is one of the most important means which enables us to meet emergency demands. Every vigorous step must be taken to build up the additive metals to their established goals."

It is hard to reconcile this statement with the action of the International Materials Conference which suspended our stockpiling program for these metals during the fighting in Korea.

As in the case of manganese where Soviet Russia is the dominant producer, Communist China is potentially the largest producer of tungsten. The Commission says:

"The long-run supply outlook abroad is not much brighter, under the assumption of a continuing cold war and the absence of China from the world market. Although the lack of Chinese supply can be temporarily compensated for by increased production in the rest of the world, present knowledge suggests that lack of reserves might preclude such compensation over a long period. It is estimated that between 85 and 90 percent of the total world reserves are in China. Moreover, production costs in China are so low and the Chinese product is of such superior quality that the possibility of China's reentry into the world market at any time is a powerful deterrent to large investment elsewhere in the world.

"A significant expansion of output is possible at the Sang Dong mine in South Korea, one of the world's greatest tungsten deposits. Reserves are large, but exploitation is currently handicapped because they are located close to the line of military activity."

In concluding the discussion of this chapter, attention should be called to the Commission's comments concerning columbium. Columbium is a new metal and is scarcer than any of the other additive metals. The Commission says:

"The outlook for large increases in columbium supplies in the future is not favorable. Production in Nigeria has declined from wartime peaks, when output was augmented by production from old tailing piles; and maintenance of Nigerian output may require a rise in the price of columbium in order to allow lower grade gravels to be worked.

"Nevertheless, it is unlikely that sufficient columbium will be forthcoming to satisfy the potential demand for high-temperature columbium alloys to be used in jet engines, gas turbines, rockets, and similar devices. The performance attained by the use of columbium will probably have to be achieved through the use of other techniques and materials. Over the longer term it is probable that columbium can be recovered efficiently from very low-grade deposits, although possibly only at a considerably higher price."

A considerably higher price for columbium might not deter its use if availability would thus be assured in view of its unusual properties for military applications.

COPPER

The Commission believes that while the known copper reserves are ample to support twice the present mine production serious obstacles must be overcome and the Commission believes there will be a tendency for demand to run ahead of copper supplies for the foreseeable future. The easing in the supply of many of the materials which were extremely tight only a few months ago, such as lead and zinc, should be considered in connection with this forecast.

Page 33 presents a table showing the distribution of copper among consuming industries. It is significant that this table lists the building industry as taking 10 percent of total copper used in the United States in 1950. On page 146 of volume I, the report says that the building industry took one-third of the copper in 1950. Statistical discrepancies of this magnitude cast doubts on the validity of the Commission's conclusions.

The Commission concedes that while copper reserves are large copper production in the United States will have a downward trend within a very few years. The Commission says:

"As of 1950, the measured, indicated, and inferred copper reserves in the United States amounted to some 25 million tons of recoverable copper. There is some difference of opinion among both geologists and mining engineers as to the long-run productive capacity these reserves can support. But the main weight of technical opinion suggests that these reserves, plus likely extensions and discoveries, cannot do more than maintain an annual capacity of 800,000 tons over the next 25 years.

"This judgment is based on the view that the present operating capacities and those now being developed are at the most efficient and economic scale for the deposits on which they are based, so that little if any further additions to capacity on existing deposits can be made. The long-run maintenance of production accordingly requires the maintenance of a reserve base close to the present scale in the face of steady depletion and lowering of grade. The new reserves that may be brought in, both as extensions of known deposits and as new occurrences, cannot, according to the available geological opinion, be expected to match the present rate of depletion of 900,000 or more tons per year. Therefore, although a level of production in the neighborhood of a million tons or more may be possible for a few years under the strong stimulation of high price and Government incentives, a long-run domestic productive capacity of 800,000 tons per year over the next 25 years may be regarded as the highest it is safe to count on.

"Indeed, it seems to be the prevalent expert judgment that whereas the 25 million tons of reserves estimated in 1950 far exceed the reserves of 25 years ago, they can support little if any increase in long-run productive capacity.

"Nor does there appear to be much chance that further technological progress in mining would increase reserves significantly by making lower grade deposits profitable, through lowering the minimum or cut-off grade of workable ore. The present loss of copper in milling is apparently at an irreducible minimum of 1 to 2 pounds per ton of ore. If the grade of ore being milled were lowered much more, the percentage recovery would drop to an uneconomic level under present prices."

The Commission shows that under these conditions the United States will have an increased dependence on foreign production. This—

"* * * raises the question as to the ability of the other free countries to meet their own requirements and at the same time supply the import needs of the United States. In 1950 United States net copper imports were already 25 percent of total mine production in the other free countries."

The Commission reviews the position of other copper producing countries and then says:

"If sufficient expansion of production is achieved, the cost of copper in 1950 dollars should stay in the neighborhood of the 1950 price range in the United States. There is a great deal of copper throughout the world that can be

profitably produced at costs below that price level, and the large question in the minds of many producers is whether the price can be depended on to remain profitable and whether governmental policies will be favorable to continued expansion. Strengthening of confidence in the price of copper through stabilization arrangements would certainly help stimulate the required development of new supplies, as would arrangements providing a favorable framework for expansion abroad."

Here again is the universal cure-all, namely, stabilization arrangements by governments to fix prices for copper.

The Commission discusses the 1952 price of copper as follows:

"The marked and sudden increases in demand since June 1950, arising out of a defense program superimposed on high levels of industrial activity in the free world, and the comparatively inflexible short-run supply of copper, raised the price sharply. The price now stands well above long-run cost of production of the principal producers through out the world. Whether or not the price will move closer to production costs in the future will depend on delicate differences between the rates of growth of supply and demand. In view of the steady need for increasing production, the price can be expected to remain sufficiently above general levels of cost to make expansion of output profitable."

The Commission failed to state that the copper market had been distorted through the operation of a two-price system—a United States domestic price of 24½ cents and a world price ranging from 35 cents to 60 cents.

The Commission closes its discussion of copper with a review of the security considerations. It says:

"Canada and Mexico, the most secure outside supply sources, could not supply full wartime import needs; but imports from all Western Hemisphere sources, plus withdrawals from the national stockpile, would assure an ample supply. It will, of course, be necessary to review the stockpile needs periodically, and its is likely that a steady growth of the stockpile will be required in rough proportion to rising demand and to growing dependence on overseas sources.

"These considerations are based on the assumption that productive capacity in the Western Hemisphere outside the United States expands commensurately with the growth of free-world demand. To the extent that this does not happen, the stockpile objective would have to be increased at an even greater rate. The expansion of capacity in the Western Hemisphere thus acquires a security significance, as does the full realization of currently economic substitution possibilities."

Once again the Commission concedes that the stockpile is a major element in our defense. Yet, it is complacent regarding the action of the International Materials Conference in curtailing stockpile acquisitions during 1952. Stockpiling was only resumed after a bitter congressional debate over the renewal of the Defense Production Act powers in 1952.

At this time, early in 1954, it is possible to reappraise the findings of the Commission. The Chilean Government is attempting to unload a vast store of copper without breaking the market. So far, it has not been successful in moving this copper. There is little reason to believe, with full employment under peacetime conditions, that there would be any real shortage of copper available to the consumers of the free world if market forces are permitted to operate.

LEAD

At this writing, early in 1954, many United States lead mines are closed and others are about to disband their operations unless there is a marked recovery in the price of lead. Two years ago, when the Paley Commission released its report, it described the demand for lead as follows:

"The demand for lead in the United States during the coming 25 years is expected to grow about 60 percent as fast as the total national output of goods and services. Allowing for the concomitant growth in scrap availability, an increase at this rate would by 1975 require about 200,000 tons more new lead per year from domestic mine production and imports than were available in 1950. Although vigorous efforts should be made by both industry and Government to maintain output, the best that can be hoped for is that domestic mine production will not decline by more than 50 percent by 1975. The United States will therefore have to rely increasingly on imports, the demand for which may be some 60 percent greater by 1975 than the 565,000 tons imported in 1950.

"A United States import demand of this magnitude, plus the likely growth in the demand for lead in the rest of the free world, would require about a doubling of mine production in the other free countries. While production in the other free countries can be expanded appreciably over the next quarter century, it is doubtful that it can be doubled."

The Paley Commission was apparently convinced that lead presents a major problem and imports will provide the only satisfactory solution. It is true that imports have supplemented our own production, but there is no evidence that under a free-enterprise system we should experience any difficulty in obtaining sufficient lead to meet all our requirements. Certainly imports are not the solution to the problem confronting lead producers today.

The Commission, on page 41, portrays the growth in the supply of scrap. It said:

"With the steady growth of the stock of lead-using products, the amount of scrap recovered from that stock in each successive year also continues to grow. Thus, during the period 1924–27 the annual average scrap production was 217,000 tons; 25 years later in the period 1947–50, it was 398,000 tons—an increase of over 80 percent. With this increase, as against the decline in domestic primary production, the relative importance of scrap supplies in total domestic production and consumption grew. In the period 1947–50 domestic scrap output was almost as large as primary production and made up one-third of total consumption. In fact, scrap production in 1947 and 1948 exceeded primary output.

"This steady growth in scrap production may be expected to continue through to 1975 at an accelerated rate, inasmuch as the greater part of the total increase in lead consumption will take place in products with a high scrap return. With the expected increase in the stock of passenger cars and trucks, storage batteries alone should return about 550,000 tons of scrap annually by 1975. Additional large amounts should be forthcoming from cable coverings, printing type, bearings, building uses, and other end products. In all, an annual rate of scrap production of about 750,000 tons may be expected in the period around 1975, with good market conditions, compared with about 400,000 tons in the period 1947–50."

If our production of durable goods is for normal consumptive uses rather than for military purposes, this scrap will stay at home, and it will go a long way toward meeting the lead shortage.

On page 44, the Commission says:

"In view of the outlook for a scarcity of newly mined lead throughout the free world for a good part of the next 25 years, total lead supplies also are expected to be short. The United States may therefore expect to find it difficult to obtain its desired imports through 1975."

No attempt will be made to discuss the year 1975, but certainly sufficient imports are not a problem for the lead and zinc industry of the United States in 1954. On the contrary, the excess imports have served to destroy American production. The Commission says:

"With demand unlikely to be satisfied over much of the coming 25-year period at prices near the current level, the price of lead may be expected to show a marked tendency to rise relative to changes in general prices."

No government should interfere with this normal tendency, as such price changes will bring about a speedy correction of any prospective shortage or excess supply much more efficiently than through government controls.

The Commission again shows its lack of faith in market forces in the following statement:

"Thus, if the adjustment in demand were left wholly to free market forces, it would lead to a very large real price increase. To avoid this large rise and to soften the impact, the measures suggested in volume I of this report to stimulate exploration, to assure a favorable economic environment for production, and to improve the possibilities of substitution have special relevance in the case of lead. Substitution can provide major relief with respect to the highly dissipative uses of lead, especially in gasoline.

Certainly, if market forces are permitted to operate, these adjustments will take place in the future as they have in the past.

The Commission discusses the tariff on lead as follows:

"There has been a tariff on lead imports since the earliest days of the Republic. At present the duty stands at 2¼ cents per pound of pig lead and bullion and 1½ cents per pound of lead contained in imported ores. The tariff has, however, been suspended until the termination of the current national emergency or until March 31, 1953, whichever is earlier, provided that the average price of lead for

any calendar month does not fall below 18 cents. In view of the growing dependence of the United States on foreign sources of lead and the desirability of encouraging production abroad a reimposition of the tariff on lead seems unjustified for the long run."

Actually, due to inflation, the tariff is of negligible significance and could not possibly be an impediment to the orderly development of the world's mineral resources. It has provided no barrier to the importation of metals and ores. A higher tariff would protect the domestic miners and would undoubtedly, over the long run, produce more lead as mines would operate under a tariff which would otherwise be closed and lost forever.

ZINC

The Commission projects United States demand for zinc as follows:

"The demand for zinc in the United States can be expected to grow roughly two-fifths as fast as the total national output of goods and services. Long-run domestic-mine production, however, even under the stimulus of continued favorable prices and of measures to encourage exploration and production proposed in volume I, cannot be expected to exceed 700,000 tons per year, which is little more than the current level of output. Consequently, the United States demand for zinc imports can be expected to increase vigorously, possibly more than doubling by 1975 to 800,000 tons annually."

It should be noted that the Commission expected the demand for lead to grow about 60 percent as fast as the total national output of goods and services. On this basis zinc should be readily available as the demand for lead will necessitate a concurrent production of zinc; in fact, the Commission seemed well aware of this relationship. This study shows the importance of mixed ores in current operations. The Commission says on page 46:

"Around 1925 the industry was just beginning to exploit the possibilities of this technological innovation. Previously 'mixed ores' containing both zinc and lead could be considered as either zinc or lead ores, but not both. At a lead smelter, for example, not only was the zinc contained in the charge unrecoverable, but it decreased lead recovery, and consequently the mine whose product was being treated was penalized; it was paid less for its product because of the consequent lower lead yield. With the selective flotation, however, both a zinc and a lead concentrate can be produced from the same ore, the two concentrates can be processed separately, and the value of both metals realized. As a result, many deposits in the Western States previously marginal or submarginal lead ore became more profitable or economic. The 25 years from 1925 to 1950 witnessed a steady development of such mines, broken only by the depression of the 1930's, as advances were continually made in the flotation technique, and mills and smelters were built to handle the ore. Thus in 1929 fewer than 20 districts produced more than 1,000 tons of zinc each; in 1949 there were more than 40 such districts."

The Commission shows that a slight price increase would bring forth substantial additional production of zinc. It said:

"If the encouragement of domestic mineral exploration and production recommended in volume I is successfully pursued, the industry should be able to maintain a rate of production of between 600,000 and 700,000 tons yearly through 1975, at about the present real cost of zinc. A slight increase in the real price level would permit the utilization of higher cost reserves, and would thus increase the industry's ability to maintain and even possibly exceed the total annual production of 700,000 tons of zinc."

It is ironic that the Commission made this statement in its report issued in 1952:

"Extensive substitutions of other materials for zinc are now taking place, and additional substitutions of the same sort have been assumed in assessing the future. Should zinc production fail to meet the growing demand at real prices close to those of recent years, the substitutions will be even more widespread."

Zinc diecasters have been affected by the shortage of nickel as this shortage has made it difficult to adequately protect zinc diecastings through plate processes. Accordingly, the diecasters have lost much of their market to substitutes. The substitutions of zinc have persisted and, in 1945, the American lead and zinc miners were not worrying about the possibility of zinc production failing to meet growing demands; they were only worried about the prospect of continuing in business.

TIN

The Commission shows that 60 percent of the free world's newly mined tin comes from southeast Asia. This area is not a dependable source of supply under existing conditions. The threat to our tin supply has been met by a stockpiling program and all indications today are that ample stocks of tin are in the United States at the present time to meet any contingency.

Furthermore as the Commission shows, the use of tin has been decreased in many end products without sacrificing their quality. The Commission says:

"Attempts are being made within the tin-can industry in the United States to reduce or eliminate the need for tin because of the extreme uncertainty of tin supply at times in the past. This has two forms: (1) substitution, in part or in whole, such as the use of welding or side-seam cements in place of solder, and the use of coated black-plate, enameled or aluminum-coated steel in place of tinplate, or even aluminum plate as a complete substitute for plated steel; and (2) economy in the use of tin, as by the use of electrolytic tin coating on one side only. Tin may also be saved through a reduction in the tin content of bearing metals, and can be eliminated entirely from some products, as by the use of printed instead of soldered circuits in electronic equipment."

Starting in 1941 this Government operated a tin smelter in Texas City, Tex., operating largely on Bolivian concentrates. The supply of tin has now reached the point that the Government is closing this operation which is further evidence of the adequacy of our tin supply.

The Commission, in this chapter, again supports intergovernmental commodity agreements. It says:

"The recommendations of volume I, especially with respect to international stabilization of raw material prices, are particularly applicable to tin and deserve United States support, provided nonrestrictive arrangements can be worked out. Past stabilization attempts in the tin market have largely been restrictive. In addition, strong efforts should be made to bring about the fullest practical expansion of secure supplies in Bolivia by stimulating the search for new reserves and by helping to overcome obstacles to production."

Since this was written a tin agreement was negotiated at Geneva during the summer of 1953. The Randall Commission, in both the majority and the minority reports, condemened such agreements in principle and on Friday, March 5, 1954, the State Department announced that the United States would not participate in this tin agreement. This means an important and welcome reversal of the philosophy expounded by the Paley Commission.

Outside of southeast Asia, the principal source of tin is Bolivia with minor production in Nigeria and the Belgian Congo. The Bolivian supply is also subject to interruption due to the political instability of the country. It is significant that most of the world's tin production has been nationalized either in the Far East or in Bolivia. The Commission discusses the production problems in the tin producing countries as follows:

"In southeast Asia the political and social difficulties in all the tin-producing countries are paramount; physical and other obstacles to continued and increased production are negligible by comparison. In Africa, on the other hand, physical obstacles such as water and labor shortages exist in Nigeria and the Belgian Congo.

"Obstacles in Bolivia are of all types—political, social, and physical. Bolivia is at a basic disadvantage in the world tin market because the majority of its deposits can be mined, and the ores processed, only at high costs. The deposits are at an altitude of over 12,000 feet, and are in the form of narrow irregular veins that have to be exploited by underground methods, in contrast to the simpler dredging operations in the rest of the world. The ores are mineralogically complex and present difficult metallurgical problems. Working conditions in the mines are especially severe, and labor efficiency is relatively low. An additional adverse factor is that almost all the mining supplies—fuel, machinery, food, and timber—not only must be imported but must be transported over exceedingly difficult terrain.

"Moreover, reserves are now of even lower grade than those from which past production has come. To exploit the low-grade reserves will require better methods of ore treatment. In addition, there are large quantities of tin in Bolivia in tailings from earlier treatment of higher grade ores. Efforts are currently under way to develop a method of extracting this tin, but in the

meanwhile Bolivian production is being maintained with difficulty within the range of 27,000 to 30,000 tons of contained tin annually."

The Commission stresses the overriding importance of security considerations. It says:

"The security problem with respect to tin is especially serious by reason of the absence of domestic primary production, the low level of domestic secondary production, and the fact that by far the largest part of supply is obtainable only from southeast Asia, one of the regions of the free world most vulnerable to aggression and disruption. Under such circumstances, an adequate national stockpile acquires overriding importance. Further, in order to maintain and possibly expand production in Bolivia—the only significant and secure supply source in the Western Hemisphere—the provision of technical assistance should be explored further and vigorously pursued, particularly with respect to the smaller mining operations."

As had already been indicated, the stockpiling of tin has reached a point where it is adequate for any conceivable contingency. The problems in Bolivia are not simple. They are involved with our entire approach toward the tendency to nationalize private investment in other countries. It will probably take more than technical assistance to cure this problem.

ANTIMONY

The Commission portrays the demand-and-supply relationship for antimony in the United States as follows:

"Consumption of antimony in the United States can be expected to grow vigorously over the next 25 years, possibly increasing by three-fourths. The supply of new antimony in 1950, largely from imports, was about 12,000 short tons in excess of consumption, so that a comparable supply in 1975 would support almost the entire projected 13,000-ton increase of new metal consumption.

"Domestic mine production is small and although it may increase it cannot be expected to produce a significant portion of future requirements. The future free world problem in antimony, is therefore, principally to supply the rest of the free world with possibly twice as much antimony in 1975 as in 1950."

The Commission shows the principal antimony producer in the United States is in the Yellow Pine district of Idaho. It said:

"Of the new antimony produced in this country, 2,297 tons came from a single mine in the Yellow Pine district of Idaho, where the antimony is associated with gold and tungsten.

"In the past 50 years great numbers of small antimony deposits have been opened and exhausted, but only 1 large deposit, the Yellow Pine, in Idaho, was found. Prospects are good that at least small deposits will continue to be uncovered, and it is believed that other known deposits will be exploited in response to a reasonably assured market at the present price of 50 cents per pound. It seems reasonable to expect that reserves will be maintained and probably increased so that by 1975 an expansion of output is probable.

"Domestic production from straight antimony ore amounted to almost 2,300 short tons in 1950. While this represents less than half the output of American mines during some of the Second World War years, it constitutes a hundredfold increase over mine production in the late 1920's. This increase is the result of the opening of the Yellow Pine deposit in the early 1930's. In the absence of other large deposits either of straight antimony ore or of ores in which antimony is associated with other minerals, a large expansion of domestic production cannot be expected. However, it is conceivable that by 1975 output will have increased to about 3,500 short tons, approximately 50 percent higher than 1950."

In spite of these facts and the Commission's belief that United States demand will continue to grow, the one important mine in Idaho has been closed through most of 1953 due to lack of demand. The Commission recognizes that the antimony business is essentially an unstable one as long as there is a real possibility that China may reenter the world antimony market. It said:

"The possibility that China (normally the world's largest producer of antimony) may return to the free world market tends to discourage new investment for production elsewhere, however. Memory of past instability in the antimony market also strengthens the hesitation of producers to make the necessary investment to expand production. Given sufficient assurance of continued markets at favorable prices, free world suppliers can be expected to meet the demand. It is accordingly desirable for the United States to join in efforts to provide reasonable

assurance of market stability to the free world producers, through the application of measures such as those proposed in volume I for increasing production abroad.

"Having adequate reserves is not enough to avert a shortage problem. Antimony prices have been characterized by wide and frequent fluctuations, and output from simple antimony deposits appears to have been quite sensitive to these changes, particularly in South America. Despite available reserves, high prices, and the promise of a sure market, sufficient output may not be forthcoming from free world sources because of other factors.

"One of these factors is the fear that favorable prices may not last long enough to justify capital investment to export production. Accordingly, producers in such areas as Bolivia and Mexico may work only high-grade pockets and may be reluctant to open or reopen lower-grade workings. These producers also fear a possible reentry of China into the world market. China has more than half the world's known reserves and is lowest cost producer. Before the Japanese invasion in 1937, China's mines supplied about two-thirds of the total world supply of antimony. Producers clearly remember the drastic collapses in the price of antimony that often attended large shipments of antimony from China to the United States in the 1930's. Whether China becomes a supply factor or not in the next few years, producers may have to be assured that their markets will be sustained and at profitable prices, before needed production can be elicited from them."

Again, the Commission has only one solution; namely, that we encourage some form of intergovernmental commodity stabilization. It would seem that greater security could be given the strategic interests of this country with a going concern mining industry in Idaho and an adequate stockpile to assure United States consumers of sufficient antimony to meet any reasonable need.

The Commission concludes its discussion of antimony with this statement:

"If certain conditions are met, output from Bolivia and Mexico plus a large potential production in Peru, can assure adequate supplies certainly for the Western Hemisphere and probably for the whole free world. One of these conditions is that other free world producers maintain their past high levels of output. More importantly, producers would have to be reasonably confident of a stable market over time. Unless foreign producers (many of whom are small, independent, and marginal) are relieved of the fear of market collapses like those they have experienced in the past, output abroad may not expand sufficiently to care for rising free world needs, possibly even at higher prices. If markets are guaranteed, the present price of antimony—50 cents per pound—appears high enough.

"During a war emergency, supplies of antimony would probably prove adequate if the present level of imports were sustained. Over the long pull, and if potential production in Bolivia, Mexico, and Peru is realized and shipments can be made, it seems probable that the United States can be relatively secure, even under full mobilization. Security would then depend both on achieving the objective of the national stockpile and on substantially unimpeded flow of material from Latin America."

Once again the Commmission suggests that the American taxpayer guarantee the markets of the world against price instability. The chapter on antimony never suggests the possibility of stabilizing the domestic market through the use of a tariff at no cost to the general taxpayer.

CADMIUM

Cadmium is largely a byproduct of zinc production. Its future supply will vary directly with that of zinc. Cadmium is a very useful material but substitutes are available for almost every application. If market forces are allowed to operate, no difficulty should be expected in balancing supply and demand. The Commission said:

"At a projected total free-world demand of 30 million pounds of primary cadmium—24 million for the United States and 6 million for the other free countries—and an estimated supply of about 17 million pounds, there would be a deficit around 1975 of 13 million pounds. A large increase in the price of cadmium could, if permitted, balance supply and demand by reducing consumption, but the market cannot serve effectively to increase supplies beyond the possibility of encouraging somewhat more complete recovery. Cadmium yields only a small fraction of the revenue from zinc-cadmium concentrates, so that even a doubling of the real price of cadmium would not greatly influence output."

It should be noted that the Commission says "a large increase in the price of cadmium could, if permitted, balance supply and demand by reducing consump-

tion." This quotation clearly shows that the Commission is still wondering whether market forces should be permitted to operate. This approach is one of the most disturbing in the entire report. The Commission shows the possibilities of substitutions as follows:

"Substantial rises in cadmium prices can be expected eventually. Such rises would serve to encourage adoption of substitutes. Fortunately, considerable substitution is possible. While cadmium is desirable in plating for such reasons as appearance, thinness of coating, and ease and efficiency of handling, it can be partially replaced by zinc and, to a lesser extent, by chromium. During the Second World War about 15 percent of the cadmium supply was conserved by substituting zinc. Absence of cadmium would not involve serious hardships in many cases, as products commonly electroplated include bolts, nuts, washers, hardware, household appliances, toys, and a great variety of other items where the use of cadmium is not indispensable. Tin and bismuth can be substituted in other uses. In pigments, while again not as desirable, chrome yellows (chromates of lead, zinc, and barium) can in some instances replace cadmium yellow.

"In sum, while many consumers may be reluctant to adopt substitutes even in the face of increase in the price of cadmium, substitution may be feasible for as much as 50 percent of the uses. The expected shortage of cadimum over the next quarter century, therefore, does not appear to offer serious handicaps to the industry. There are likely to be sufficient supplies for those users who find cadmium indispensable. Meanwhile, as supplies become tighter research into substitution possibilities should be encouraged."

Under these conditions it is difficult to see where any serious problem of civilian supply is presented with cadmium. Likewise, the Commission shows that no serious security problems are involved. It says:

"It is probable that wartime military requirements can largely be met by restricting nonessential civilian uses. Such restrictions may not even proportionately decrease production of nonessential end products, because of the possibility of some substituting of other plating materials for cadimum. Based on these factors, on domestic zinc reserves and output, on the relative safety of foreign sources, and on the current national stockpile and planned purchases for the stockpile, the United States is apparently in a relatively secure position were an all-out emergency to develop. The United States could count on enough cadmium to satisfy absolutely essential needs were all non-Western Hemisphere supplies cut off and possibly even if it were forced to rely on domestic resources alone. As in the Second World War, however, there would be little for the civilian economy."

BISMUTH

No serious problem is presented with bismuth. The Commission said:

"Bismuth is produced principally as a byproduct of lead and copper refining, and the likely level of production of these metals by 1975 indicates that the supply of bismuth from these sources would not meet estimated demand. This will probably be so even should the potentially large output of bismuth be achieved from mines not now operating in Bolivia.

"It is therefore expected that the price of bismuth will rise but that this rise need not be substantial nor permanent if presently known substitutes are introduced to the fullest extent possible.

"Bismuth production has in the past been limited by cartel activities; the United States has an interest in helping to prevent similar restriction in the future.

"At present, security considerations do not indicate the need for Government action beyond the current defense-mobilization program."

BERYLLIUM

Beryllium is a lightweight metal whose properties will make it more important as new technology is developed. Its principal usefulness has been as an alloying agent to harden and strengthen copper. These alloys make possible the production of springs and other copper parts to withstand fatigue without impairing the electrical conductivity of copper. Beryllium has an important new use in the atomic-energy field where it serves as a moderator and neutron reflector.

The Commission believes that total free-world reserves are adequate to meet demands but this will necessitate a vigorous policy of exploration and development.

The United States has obtained most of its beryl ore imports from Brazil and the Union of South Africa. Beryl is generally produced as a coproduct of mica, feldspar, and other minerals. If low-grade resources or beryl were developed, the United States could meet its projected demands from domestic sources. In view of the importance of this material, the development of our own resources is of paramount importance.

The Commission concludes its discussion of beryl with the following statement:

"While supplies may be tight over the next few years, a 60-percent expansion of the output of foreign free-world sources appears feasible by 1975. This would be more than sufficient to meet projected free-world needs. It appears that physical possibilities exist for even a greater growth of output, so that expansion in demand greater than projected could be met. The new supplies should be available at real costs, in 1950 dollars, comparable to those of present production. Thus the outlook for supplies depends principally on political and economic circumstances.

"Present efforts by business and by various Government agencies in the broad area of research seem adequate.

"Current reliance on foreign sources—Brazil, Africa, India, and Argentina—for about 90 percent of United States supplies defines the nature and extent of our security problem. In the event imports were greatly reduced, the United States would soon find its existing reserves and output completely inadequate in wartime.

"The national stockpile goal has been set at an amount deemed adequate for presently anticipated wartime needs, but in view of the probably rapid expansion of beryllium consumption, frequent review will be required. The basic immediate problem is to fulfill the present goal. In the present phase of research in the atomic-energy program, and in the foreseeable future, a substitute for beryllium does not appear to be available. Outside this field, there are actual and potential substitutes for many uses, for example, aluminum-bronze, phosphor-bronze, a manganese-nickel-copper alloy, and possibly zirconium, but these substitutes are generally inferior or have not been fully explored, and some are in short supply. At the present time, substantial adoption of substitutes would require extensive, costly, and time-consuming research."

LIGHT METALS

ALUMINUM—CHAPTER 13

The Commission believes that aluminum will find increasing use as a substitute for copper, lead, zinc, and tin. It, of course, has properties, particularly in the aircraft industry, in which its lightness gives it an unexcelled competitive advantage. The Commission believes:

"Aluminum consumption has grown ninefold in the last 25 years. Postwar consumption is now about 4 times that of 1940, and more would be consumed if available. This postwar increase was stimulated by the ready availability of aluminum immediately following the war, by shortages of steel, copper, and zinc, by rising relative prices in these competing metals, by the development of new aluminum uses, and by the wartime training of 1 million workers familiar with aluminum fabrication when previously there had been but a handful. The rapidly growing construction market consumed, in 1949, as much metal as the total produced in 1939. Great increases in demand occurred in electric-power transmission, in the transportation fields, particularly trucks and trailers, and in cooking utensils and appliances. The applications of aluminum are becoming widespread throughout the economy; its economic advantages are being demonstrated by many permanent displacements of competing materials. Currently it is replacing considerable quantities of copper in transmission lines, industrial wiring, motors, electrical equipment, and hardware. It has almost completely superseded lead and tin in collapsible containers, and, with plastic material, is being used increasingly in place of lead for electrical cable coverings and in home construction. It is substitutable for zinc in die castings and protective steel coatings, and is used in place of other foil metals and of paper for packaging purposes."

The Commission believes there should be no fundamental difficulty in meeting the prospective demands of aluminum over the foreseeable future, however rapidly they may grow. The problem is primarily one of security. If the United States should become increasingly dependent on primary producing capacity outside its borders serious problems of wartime security will arise.

The Commission expresses concern with the rate of depletion of our bauxite reserves and believes processes will be developed that will permit the domestic aluminum industry to be based in an emergency on more abundant low-grade ores and clays. Our experience in World War II, when so many vessels were sunk in the Caribbean, makes this admonition a wise one. The Commission shows that the supply of aluminum can be increased greatly without serious increase in cost. It states:

"Whereas aluminum was, over most of its short commercial life, considerably more expensive than copper and much more expensive than lead or zinc, it is now cheaper by weight than any of these, and much the cheapest by volume. The future cost outlook continues to be in favor of aluminum, so that substitutions already made attractive by the shift in relative prices may become even more attractive, while further technologic developments can be expected to widen the use of aluminum, especially in structural and electrical uses and in new uses.

"The total quantity of aluminum that may be substituted for other nonferrous metals is not likely to exceed a million tons, however, and hence ultimately may be dwarfed by other uses of aluminum, such as substitutions for steel and wood. Substitution for the heavier nonferrous metals may nevertheless prove to be very important in forestalling shortages that might otherwise arise in those metals.

"Possibilities for new uses and substitution in the construction, transportation, and machinery areas are virtually unlimited. Because of their strength, lightness, and noncorrosive properties, aluminum and aluminum alloys may be expected to be used increasingly in place of wood and steel. In many applications in the construction industry aluminum can be installed more quickly than heavier metals, has a longer life, reflects heat, and so conserves fuel, and in some uses does not require painting. In commercial transportation the substitution of aluminum in buses, trucks, trailers, railroad cars, and shipping containers offers

substantial economies in operating and maintenance costs, for as the weight of transporting vehicles is reduced, payload may be increased and more freight can be moved wih less fuel, tires, repairs, and investment in transportation facilities. Similarly, in agricultural and manufacturing machinery, in materials-handling equipment, in irrigation lines, in tools and household appliances, in food containers, and in many other uses aluminum will probably be used to produce lighter, more durable, and less costly products and equipment."

The military applications of aluminum are of paramount importance. The increased capacity to meet civilian demand provides a cushion for military requirements. However, as the use of aluminum further pervades the economy, many of its applications become essential for civilian uses. Therefore, shortages will invariably occur under full mobilization conditions.

One of the principal cost items in producing aluminum is electric power. With present technology, approximately 9 kilowatt-hours of electric energy are required for each pound of metal produced. An increase of 1 mill per kilowatt-hour adds approximately 1 cent per pound to the cost of aluminum under present technology. As the demand for aluminum increases, the necessity of securing adequate low-cost power will become a major consideration. The aluminum industry was originally dependent almost entirely on low-cost hydroelectric power. As the population increased near these original sites, the demand from other users of power made it necessary for aluminum producers to use more remote hydroelectric sources and begin to use power produced from natural gas and lignite. The added cost of power from these fuels in the gulf area has been offset by the lower transportation cost of both raw materials and finished products. Undoubtedly, new techniques will be developed which will reduce the energy requirement per pound of aluminum. The Commission stated that, if the consumption of power per pound of metal were to decrease by about a third, the input cost of power produced from coal or lignite would be roughly equal to the present average cost. The Commission believes this estimate conservative, as a new aluminum reduction plant requires only 7.5 kilowatt-hours per pound of aluminum as compared to 9 kilowatt-hours for existing facilities.

Bauxite is now the only material commercially used as a source of aluminum. The Commission believes that steps should be taken to develop processes to extract aluminum from lower grade bauxitic ores and clays. Currently, one-third of our bauxite requirements are derived from domestic deposits. The balance is imported from the Caribbean area. Canadian producers are entirely dependent on the Caribbean area for bauxite. Enemy submarines could seriously reduce the production of primary aluminum by both domestic and Canadian plants unless our own reserves are further developed and new materials and processes become available. The Western Hemisphere is fortunate in the vast undeveloped reserves of bauxite are present in South America and throughout the Caribbean area. The security problem is far less serious than with materials which must be transported across long sealanes from Africa and Asia.

The Commission summarizes its position on the supply-demand relationship with the following statement:

"During the next 25 years no peacetime shortage either of materials or of electric energy need limit supplies of aluminum even though demand should increase fivefold or more both in the United States and in the rest of the free world. From the standpoint of physical supply of materials and power, substantial increases in production should be possible at real costs that should continue to favor the growth of consumption."

The Commission then comes to the conclusion that to avoid shortages "public participation in the development of the industry is necessary." This again shows that, despite lip service to free enterprise, the Commission's staff have a basic bias toward socialism and Government controls. The Commission said:

"Whether or not shortages will in fact be avoided depends largely on the rate at which new facilities are constructed. Problems of public policy are involved. Public participation in the development of the industry is necessary, primarily because of (*a*) the overriding importance of security considerations, (*b*) the Government's position in the development of low-cost hydroelectric power in multipurpose power and stream control projects, and (*c*) the likelihood that the Government policy may actively foster competition in the aluminum industry during the next quarter century."

The security problem in aluminum is of paramount importance as already indicated. The Commission said:

"A critical factor is the tendency for the essential aluminum needs of a possible war to run ahead of peacetime consumption. This is clearly true at present and may continue to be so in the future, although the gap between full war needs and peacetime demand will probably decrease as the productive base of the industry expands. As long as this situation continues and cannot be provided for by stockpiling or other similar measures, preparedness will require a Government program to keep aluminum-producing capacity ahead of peacetime consumption. Thus, for a considerable period in the future the Government may play a major role in initiating the construction of the new productive capacity in determining plant locations.

"Security considerations permitting, it is likely that during the next 25 years the United States will obtain an increasing part of its aluminum supply from Canada and possibly from overseas sources where abundant low-cost power is potentially available near large bauxite deposits. To date the United States has relied on domestic reduction plants for most of its aluminum. Before World War I these plants were based on low-cost hydroelectric power and were quite able to compete with other countries in the United States market, probably even in the absence of a tariff. During World War II four high-cost reduction plants were built by the Government because they could be built rapidly to use existing power capacity made available by brownouts or other arrangements. These plants were retired after the war, but the reduction equipment has since been utilized elsewhere. In the current defense program domestic plants are being constructed or reactivated under governmental encouragement at sites that, for the most part, are presumably economical from the long-run point of view. A major portion of the initial expansion is based on power produced from natural gas and lignite, and additional capacity is planned for the Columbia River area, where about 3.5 million kilowatts of hydroelectric capacity are now under construction. As previously indicated, these plants, using various sources of power, are not expected to have significantly different total real costs for aluminum delivered to fabricators.

"Meanwhile, the lower cost potentialities for aluminum production outside the United States have not as yet been utilized, because satisfactory arrangements could not be made, because the time required would have been excessive or because the wartime security of these areas was in question. The security element is particularly significant, since reliance upon sources outside the United States in time of war may involve the risk of shipping metal over hazardous sealanes, the risks and cost of defending overseas reduction plants and power facilities, and the necessity of evaluating these factors 6 to 10 years in advance of production."

The Commission once again shows its belief in the Harry Dexter White philosophy in leaving resources in the ground in order to have them when we need them. It said:

"Were it not for the development in the recent past of a method of treating high-silica ores that could not previously be used, United States reserves of bauxite would now be fairly close to exhaustion. The new method made usable about 30 million tons of the present 40 million tons of total reserves of commercial bauxite. These reserves containing approximately 10 million tons of aluminum, would be able to support the needs of the United States only for a few years under great emergency stress. As the reserves are gradually used up and as wartime needs continue to grow, the reserves will become increasingly deficient in their ability to support emergency production if overseas supplies should be cut off. This suggests that it is desirable to avoid increasing the rate of withdrawal of domestic reserves, and that at some time in the future it may be necessary to set aside a portion of the remaining domestic bauxite deposits as an insurance against possible war needs. It is essential that further development of processes for utilizing the lower grades of bauxite and aluminum-bearing clays be vigorously pursued, and that further experience be acquired in handling these materials."

The industry has shown that, left to its own devices, it will develop these resources without Government control or supervision. The Commission discusses stockpiling in its statement given below, as a sound position for the country to follow:

"The stockpiling of aluminum must clearly be part of the aluminum security program, both to prevent wartime interruption of supplies and to support initial high level of wartime consumption until further adjustment in consumption and production can be made. If the United States comes to depend increasingly on imported primary aluminum, the stockpile objective will have to be increased.

The stockpile should be adequate to bridge any gap created by interruption of overseas supplies until the sealanes can be reopened or domestic output increased.

"It is preferable to stockpile aluminum metal rather than bauxite. The cost of acquisition of the aluminum is higher but the protection is much greater. In the event of loss of alumina or aluminum capacity from damage or destruction, or interference with transportation, the bauxite may not be as useful as metallic aluminum would be. Even if plants are not damaged or isolated, aluminum includes a 'stockpile' of plant capacity, labor, power, and transportation services. If overseas supplies of bauxite are not cut off in war, a bauxite stockpile would not support consumption in excess of primary producing capacity, but a stockpile of aluminum would. However, a stockpile of bauxite is also considered essential to enable all producing facilities to continue full-scale operation at a time of emergency."

The Commission discusses tariffs and import policy for aluminum at length. It believes that it would be desirable to further imports from Canada if the lower Canadian cost were passed on to the United States consumers. This discussion is academic as the Commission states, on page 71:

"Under present market conditions there is no apparent tendency for the lower Canadian costs to be passed on to the United States market, the aluminum being sold at the going United States price. The only way that the Canadian supplies could help reduce the cost to the United States consumer is as an alternative to further domestic expansion into higher cost production. If Canadian supplies should become very large, they would presumably tend to lower the price of aluminum."

The Commission discusses the tariff as follows:

"The principle that should govern United States tariff policy must be that it should be neither so high as to prevent recourse to low-cost sources outside the United States nor so low that it leads to an unbalanced dependence on foreign plants.

"No hard and fast set of rules can be advanced to achieve the desirable geographical pattern of aluminum supply consistent with the above principle. This is a matter for continuing governmental concern as the situation develops. Clearly a healthy domestic industry must be preserved, but this need not be inconsistent with a substantial dependence on imports from low-cost foreign sources, provided these lower costs are passed on either in lower domestic prices of aluminum or duty paid on the imports, and if the needs of security can be met."

This statement, in reality, is nothing but a platitude. The real philosophy of the Commission is shown in the following:

"There is no justification for the present United States bauxite tariff of 50 cents a long ton, in view of the dependence on foreign bauxite and the desirability of slowing down the rate of withdrawal of domestic bauxite reserves. As indicated in volume I, tariffs on raw materials in general are unjustified; they seem particularly unjustified with respect to bauxite. Similarly the reimposition of the tariff on scrap of 1.5 cents per pound, presently suspended, would not be desirable.

"The present tariff of 3 cents per pound on fabricated aluminum in the form of coil, sheet, plate, and bars seems unnecessary because of the higher cost of fabrication abroad. Adjusting this tariff to correspond with the level of the tariff on pig and ingot would be consistent with the general policy outlined above, allowing for the fact that to produce a pound of fabricated aluminum requires more than a pound of ingot."

The Commission, in addition to urging public control of the aluminum industry, uses the argument for such control as an excuse to foster its views on public power. It said:

"As discussed in detail in the accompanying chapter on electrical energy, most of the remaining undeveloped low-cost hydroelectric power sites in the United States require multipurpose development (power, navigation, flood control, or irrigation) in order to make the projects economically sound. Because projects of this type can only be undertaken through public action, the Government has the responsibility to see that hydroelectric power is made available to the aluminum industry to the extent that this source of power provides the lowest total real cost to the United States for its aluminum supply consistent with security considerations. In addition, synchronizing the hydro program with the defense program for aluminum may obviate the necessity for emergency development of higher cost but more rapidly expandable power capacity, such as occurred during the Second World War.

"This argument is not meant to suggest that hydroelectric power should be developed and specifically allocated or set aside for aluminum production. Such

a policy would be shortsighted since greater benefit to the country might well be realized from alternative uses of low-cost power. Heavy power-consuming industries have in the past, however frequently served to accelerate the development of power capacity by quickly providing a substantial market for large installations. During the next 25 years there will be undoubtedly a number of opportunities of this type for the domestic aluminum industry.

"Public control of hydroelectric development means that insofar as this source of power provides the lowest real costs, the Government will directly or indirectly exercise considerable influence over the timing, location, magnitude, and ownership of new domestic aluminum capacity. Consequently, to the extent that the growth and security objectives of the United States require it, the continuous long-run programing of hydroelectric power developments should be vigorously pursued."

The Commission concludes with a further evidence of its desire to control the industry by citing the necessity of maintaining a competitive structure within the industries and said:

"For many years the aluminum industry in the United States was dominated by a single integrated producer, the Aluminum Company of America (Alcoa). In 1945 the Circuit Court of Appeals for the Second Circuit, sitting as a court of last resort in an antitrust action started by the Government in 1937, held that Alcoa had monopolized the aluminum ingot market in violation of the Sherman Act. The court ordered that remedial action be deferred until plans were developed for the disposal of Government-owned plants built during the Second World War.

"In 1940, under the stimulation of rising defense needs and with the help of a loan from the Reconstruction Finance Corporation, the Reynolds Metal Co. (previously an aluminum fabricator) became the second primary producer in the United States. During that period of expansion the Government, through the Defense Plant Corporation, built 9 reduction plants, 2 alumina plants, and numerous fabricating plants. Most of these facilities were constructed and operated for the Government by Alcoa. The total Government investment amounted to nearly three-quarters of a billion dollars.

"In disposing of these plants following the Second World War the disposal authorities were instructed by statute to foster new and independent enterprises. In this way a third United States primary producer, Kaiser Aluminum & Chemical Corp., entered the aluminum industry. The Aanaconda Copper Co. will become a fourth producer as soon as production facilities in Montana are completed.

"In 1950 the Federal district court, passing on the remedial action appropriate under the 1945 judgment, refused to declare, as petitioned by Alcoa, that 'effective competitive conditions now prevail' in the aluminum ingot market. It made this decision despite the intervening development of two other important producers. In order to promote competitive conditions the court ordered owners of shares of both Alcoa and Aluminum Limited, the sole Canadian producer, to sell their holdings of one or the other. The court denied at that time the Government's request for an order requiring Alcoa to divest itself of an integrated group of plants, but retained jurisdiction of the case for 5 years to enable the Government to apply for further relief, if necessary (final judgment, July 6, 1950, *United States* v. *Aluminum Co. of America* (U. S. District Court (S. D. N. Y.) Equity No. 85–73).

"The Government will continue to play a significant role in determining the competitive structure of the aluminum industry, not only through its antitrust function but also because of its responsibility for multipurpose power development and for insuring adequate aluminum capacity for wartime. Primary aluminum production cannot be made a small business activity. A considerable amount of vertical integration through the mining, reduction, and fabricating stages appears to be necessary for economic operations, and this, together with the minimum scale required at each of the several stages, makes necessary a very large initial investment. For example, it has been estimated that a capital investment of approximately $65 million is currently required for a modest integrated operation. In addition, new entrants must overcome such problems as obtaining an assured supply of bauxite and low-cost power.

"In spite of these difficulties, however, the projected growth of the domestic aluminum industry should provide opportunities for a number of new firms, and to this end the Government should continue its efforts to attract new entrants that give reasonable promise of providing improvements in processes, products, new markets, and lower prices."

MAGNESIUM—CHAPTER 14

Magnesium is a material with great future possibilities. It is the lightest of all structural metals, having two-thirds the weight of aluminum and less than one-fourth that of steel. It is particularly attractive from a security standpoint in that it can be produced in unlimited quantities from sea water. It is one metal in which there is obviously no possibility of a basic shortage.

The principal problem in furthering the use of magnesium is to improve our manufacturing processes. The Commission states:

"Whether or not peacetime commercial demand will grow to hundreds of thousands of tons annually depends on whether various technological and economic disadvantages of the metal can be overcome. The low corrosion-resistance of magnesium and its alloys still proves a deterrent to broader use. The inflammability of magnesium cuttings and dust in machining operations also has been a difficult problem, but one that can be overcome. In addition, the low tensile strength and inelasticity of magnesium alloys compared to aluminum more than offset their lighter weight in many uses. Finally, prices of rolled and fabricated magnesium products have been higher than the levels that can be expected at a later stage of development of the industry. These factors have limited the commercial use of magnesium."

Magnesium is being used in increasing amounts as a metallic scavenger and deoxidizing agent as, for example, in water heaters, underground pipelines, and ships "in mothballs."

An additional market of considerable size may be the ultimate substitution of magnesium for zinc in dry batteries. Magnesium has also found a place in the diecasting industry, displacing zinc and other metals.

The Commission concludes its discussion of magnesium as follows:

"The supply of the various raw materials required for magnesium production—sea water and lime for the electrolytic process, for example—is ample to support a practically unlimited expansion of output. Low-cost hydroelectric power may not be available for a sizable expansion, but ample quantities of power can be produced from gas, coal, or lignite. Such power may be somewhat more costly than hydropower, but this fact alone should not impair the competitive position of magnesuim; both aluminum and magnesium require about the same amount of electric energy per pound of metal produced.

"The price of primary magnesium probably will not rise appreciably over the next generation, relative to prices in general. More likely, the price in dollars of constant purchasing power will fall below the present level due to technologic progress and increased competition. More significantly, price reductions for fabricated shapes can be expected, as technological improvements and advantages of large-scale operations materialize.

"A national magnesium stockpile is required because of the great disparity between wartime and peacetime needs. This disparity will persist for some time even though peacetime demands may increase greatly, because of rapidly expanding potential military demands. Furthermore, as peacetime consumption increases, many civilian uses are likely to become essential even in wartime.

"A growing dependence on magnesium for civilian and military requirements has a great security value, since output from domestic resources can be increased at will. Consequently it is in the public interest to encourage private research on general magnesium technology that will help free the economy from dependence on material whose wartime supply is more vulnerable."

TITANIUM—CHAPTER 15

The Commission reviews the properties of titanium and its great desirability as a material for the aircraft industry. The Commission estimates that, if a continuous economic production process is discovered, the demand for titanium might reach somewhere between 500,000 to 2 million tons annually. It is significant that testimony before the Senate Subcommittee on Minerals, Metals, and Fuels Economics showed that military demand alone, under full mobilization conditions with aircraft designs now contemplated, would require more than 500,000 tons by 1957. This shows conclusively the difficulty in making long-range forecasts such as have been attempted through the Commission's study.

ZIRCONIUM—CHAPTER 16

Zirconium, like titanium, is a comparatively new metal. As late as 1950 approximately 25,000 short tons of zircons were consumed in the United States and about 25 short tons of pure zirconium metal. The Commission reviews the new uses of zirconium as follows:

"The demand for zirconium, alloyed with steel, magnesium, cast iron, copper, nickel, and other metals can conceivably become very large. If experiments with zirconium boride (which can withstand temperatures up to 6,000° F.) are successful, considerable use of this alloy may develop in rockets and jets. While technical problems exist in the production of zirconium alloys, these alloys do not face metallurgical difficulties as serious as those involved in the reduction of zirconium to pure metal. Consequently, their wider use need not await the metallurgical developments required to make metallic zirconium commercial.

"New and expanded markets await zirconium in such diverse applications as surgical equipment; high-power and high-intensity electric-arc lamps; as a 'getter' in radio tubes; as an exceptionally noncorrosive lining for tanks, pipes, valves, and the like; and as a possible substitute for other metals (e. g., tantalum, tungsten, beryllium). As implied above, the demand for metal in these uses and in applications yet unknown will depend on success in reducing cost of production.

"Cost will not affect nuclear uses quite so much, but no one can estimate how much zirconium will be demanded by nuclear uses. In any event, it appears that zirconium will remain a small-tonnage metal, but may have a large number of highly essential uses as the progress of technology requires higher and higher standards of performance in resistance to corrosion, in ability to withstand high temperatures, and in suitability for nuclear reaction structures."

Zircon is produced commercially in the United States by two companies in Florida as a byproduct of titanium operations. It is also abundant in several other areas of the United States. The Commission says that—

"While estimates of reserves are little more than speculative, United States reserves alone are judged by industry and Government experts to be ample for the next 25 years even should the demand for zirconium metal increase fiftyfold by 1975 and all other uses should double."

The Commission concludes its discussion of zirconium with the following statement:

"It appears that zirconium's future significance lies in three important areas: (1) In established and diverse nonmetallic uses; (2) as a possible superior substitute for scarce materials in certain high-priority uses, particularly where corrosion-resistance or extreme temperature advantages are vital; and (3) as a construction material for nuclear reactors.

"Technologic advances can be anticipated that may bring the prices of zirconium metal and alloys down far enough to shift the consumption patterns to greater emphasis upon the metal and its alloys, although nonmetallic uses are likely to remain quantitatively more important.

"Problems of supply relating to security do not loom large despite the strong preference for imports. Even if demand increases substantially, ore supply may not be much of a problem in an emergency, for many of the nonmetallic uses are nonessential. Nevertheless, the national stockpile of zirconium ores must be retained as insurance. Federal programs of exploration should include zircon inasmuch as the future growth of demand could well require enlarged reserves."

MISCELLANEOUS STRATEGIC MATERIALS

SULFUR—CHAPTER 17

Sulfur is one of the most important elements used by American industry. About 75 percent of all the sulfur consumed domestically is processed into sulfuric acid. Hydrochloric acid and nitric acid are both substitutes for sulfuric acid but their cost is greater. The Commission states that hydrochloric acid costs about four times as much as sulfuric acid. Sulfuric acid is widely used throughout American industry and plays a very important part in the manufacture of fertilizers.

The United States is a net exporter of sulfur and, in fact, according to the Commission, exports from the United States account for approximately 25 percent of the sulfur consumed by other free world countries.

American sulfur has been largely produced by the Frasch process. This is a low-cost process and is the reason that United States sulfur has assumed as important a place in world markets.

Sulfur is available from other sources, both within the United States and abroad. It can be produced by roasting pyrites, by recovery from petroleum gases, and it can also be recovered from smelter fumes. Under free market conditions, there is no incentive to such conversion until the price relationship between United States Frasch-process sulfur and other forms of sulfur approach each other. The Commission states that, in 1951, the price of United States native sulfur delivered in England was about $7 per ton less than the sulfur in pyrites from Spain. Needless to say, no conversion will take place under such conditions.

At the time the President's Materials Policy Commission report was issued, the United States was participating in an international allocation of sulfur through the International Materials Conference. These allocations deprived United States consumers of sulfur. They prevented the transition to pyrites in other countries and served to artificially deplete United States reserves.

The Commission viewed these results with equanimity. The sulfur industry will respond to market forces, and there is no reason for concern as to the availability of sulfur since price increases for sulfur will tend to foster the use of hydrochloric and nitric acid to conserve the use of sulfur, to foster exploration and discovery, and make it worthwhile for firms to invest in the capital equipment necessary to roast pyrites and recover sulfur from smelter gases.

The Commission concludes its discussion of sulfur with the following statement:

"Although the current international tightness of sulfur supplies may continue for a few years, it is possible that a balance between United States domestic supplies and domestic and export demands may be achieved by 1955 or 1956 with the benefit of accelerated amortization. If no additional low-cost deposits are discovered in the United States by that time and if exports are at about the present level, the current transition to higher cost sources of sulfur will continue, so that roughly 25 percent of total United States supply can be expected to come from non-Frasch sources in 1956 as compared to about 15 percent in 1950.

"With continued increase in domestic demand and the indicated limits of reserves of native sulfur, it may be expected that the transition to higher cost forms will continue, and that by 1975 the United States may be securing the major portion of its sulfur from other than salt-dome deposits. By that time and in the absence of significant technological change, the real cost of sulfur may be 25 percent to 50 percent above the present level. The price of sulfur may have to rise more than real costs in order to induce the new capital investment required, in the face of the risks that emergence of additional low-cost supplies would put before the high-cost producers.

"Two considerations stand out:

"(1) The additional costs of producing from non-Frasch sources must be kept to a minimum. A great deal of private research on more efficient production

from non-Frasch sources has recently been started, and promising results have appeared. Recovery practices in general seem to offer much room for improvement, especially those that also lessen the social costs of air and stream pollution, although the cost of sulfur recovered by antipollution measures is likely to be considerably higher than from other sources.

"(2) Investment in non-Frasch sources, principally pyrites mining, must take place promptly as needed. The chief deterrent to pyrites development during the present shortage has been the existence of a market price too low to cover the cost of pyrites production. In addition, there has reportedly been private uncertainty as to the exact need for increased supplies, and fear that low-cost reserves may be so extensive as to threaten higher cost competition. Public information on the extent of salt-dome reserves is inadequate. The Geological Survey should take the initiative in obtaining better reserve information on which future public policy can be based.

"In the event of war the increased need for aviation gasoline and explosives may raise the total demand for sulfur by about 10 percent. It is generally held that should it not be possible immediately to increase the output of sulfur, civilian consumption (including phosphate fertilizers) could be reduced substantially for a year or two without substantial harm to the economy. There is no formal stockpile program for sulfur, but the present policy of the Government is to operate the allocations program so as to prevent private stocks from falling below an amount equal to 5 to 6 months of production.

"The security advantages of avoiding future shortages, of having available larger stocks or readily expansible production, and of keeping down the real costs of sulfur are clear."

FLUORSPAR—CHAPTER 18

Fluorspar is a relatively new critical material, as the Commission shows:

"Extensive use of fluorspar in the United States did not develop until the end of the 19th century. Until 1887, the principal uses of fluorspar were in the manufacture of glass, enamels, and hydrofluoric acid, while small quantities were used as a metallurgical flux. At that time, annual consumption was about 5,000 short tons. With the swift development of open-hearth steel after 1888, and with increased demand from ceramic, chemical, and aluminum industries, annual consumption increased almost a hundredfold by 1950.

"Fluorspar is a nonmetallic mineral consisting of calcium fluoride (CaF_2). In mining, grades of fluorspar ore containing 35 percent or more of CaF_2 are considered commercial although under certain favorable economic conditions, as low as 30 percent is acceptable. After milling, industrial grades of fluorspar normally contain 80 to 98 percent CaF_2. Virtually all commercial fluorspar consists of three grades, based on the content of calcium floride and certain specifications regarding impurities: (1) Acid grade, containing at least 97 percent calcium floride; (2) ceramic grade, containing generally not less than 93 percent, and (3) metallurgical grade, containing 80 percent or more."

The Commission shows that there is no long-range concern over the adequacy of fluorine sources, but for the immediate future there will be a relatively tight situation. It says:

"In 1950, domestic mines produced 275,000 short tons of fluorspar of all grades. Imports established a new record of about 165,000 short tons in 1950, a gain of 72 percent over 1949 and 47 percent over 1948, the former record year. The largest foreign source is Mexico. Other suppliers include Newfoundland, Spain, Germany, and Italy.

"United States reserves of commercial fluorspar are the largest in the world, constituting about 40 percent of the free world total.

"At 1950 rates of consumption, presently known United States commercial reserves could 'support' United States demands for fluorspar for only about 15 years. However, discovery of new deposits is certain; in addition, only recently has the price been high enough to warrant consideration of prospects handicapped by unfavorable transportation. Furthermore, the likelihood of finding additional reserves adjacent to known reserves is favorable because producers usually do not develop fluorspar deposits very far ahead of actual mining operations. Despite these possibilities, many geologists feel that discovery of very large new deposits in the United States is unlikely.

"Consideration of the reserve position and of the historical production record suggests that the domestic fluorspar industry is past its peak rate of growth and that only limited further expansion can be expected. A conservative estimate of United States mine output in 1975 would be about 300,000 short tons, or roughly 10 percent higher than in 1950.

"Imports cannot be relied on over the long run to close the gap between United States demand and domestic supply of fluorspar. The United States must therefore expect to turn to another source of fluorine, namely, phosphate rock.

"Within a decade it is expected that natural fluorspar output will be supplemented substantially by fluorine compounds from phosphate rock. Phosphate rock reserves in the United States and other localities in the free world are enormous. The scale of production of fluorine products, however, is limited by the need for special equipment to extract the fluorine compounds, and by the demand for phosphate fertilizer and chemical phosphate, of which fluorine compounds are potentially a byproduct."

The Commission concludes its discussion of fluorspar with the following:

"If the United States and the other free countries were compelled in the future to rely on natural fluorspar alone, serious obstacles to growth and security would emerge. Since the free world would find it difficult to meet its needs from natural fluorspar, substantial price increases would follow.

"Production abroad and imports to the United States can probably be expanded until such time as phosphate rock does make its expected contribution, provided foreign fluorspar resources are more fully utilized than at present. During the next few years, until fluorine from phosphate rock is widely used, imports of fluorspar will probably remain significant, perhaps even a larger proportion of United States supply than in 1950.

"United States output, imports, and stockpiles of fluorspar place the United States in a generally secure position over the next 5 years, except to the extent that acid grade remains scarce. However, present programs, if achieved, should resolve the shortage within a few years.

"Much of the fluorspar consumed in the glass and enamel industries could be withdrawn in times of emergency. In addition, substitutes for fluorspar in steelmaking, such as calcium chloride and ilmenite, could be used in wartime."

SPECIAL STRATEGIC MATERIALS—CHAPTER 19

This chapter discusses five strategic materials of special importance. They are asbestos, industrial diamonds, mercury, mica, and quartz crystals. The Commission says:

"These are essential minerals, but domestic reserves are either nonexistent or highly inadequate, both as to quantity and quality. The bulk of United States needs must therefore be supplied by imports from other countries of the free world, the reserves of which are deemed adequate to satisfy all free world needs. In some instances, however, there are potential obstacles to expansion of output. Moreover, as the import routes are strategically vulnerable, security problems arise.

"These security problems must be met by accumulating and maintaining an adequate stockpile and ultimately by the developing of synthetic substitutes and of processes for upgrading low-quality materials from secure sources."

ASBESTOS

United States consumption of asbestos has grown markedly since 1925. Special grades of asbestos, with high electrical resistance and long fibers which can be spun, present the major problems. These grades have come principally from southern Rhodesia.

On page 91 the Commission says:

"Asbestos is essential in the production of insulating, fire-resistant and acid-resistant textiles; for gaskets and pipe coverings in ships, airplanes, and power-plants; and for friction materials in clutches and brake bands. Asbestos combined with cement has found increasing use as roofing and siding materials, a use for which it is excellent. These uses result in a demand for two distinct types of the mineral—long-fiber asbestos that can be woven into textiles, and short-fiber asbestos for other uses."

The Commission summarizes the asbestos situation as follows:

"Although there are no apparent physical obstacles to an increase in asbestos production, output might lag behind a growing free world demand because of the situation in Africa, where expansion beyond the notable postwar increases are inhibited by desires of producers to avoid overextension of facilities, to maintain a balanced production between standard and special grades, and to assure that the industry, and the communities that depend upon it, have long life.

"Nevertheless, it is unlikely that a significant long-term rise in the price of asbestos relative to the general price level will occur, as there are promising possibilities for substitution. In recent years the glass industry has devoted considerable effort to the development of glass fibers that can be used for textiles and insulating materials; these glass fibers have already given considerable competition to asbestos. General substitution, however, is not in sight as long as the production costs of chemically stable glass fibers continue to be high. There are also some attempts to develop synthetic asbestos, but so far not much headway has been made. Research in the chemical and mechanical treatment of natural asbestos has, however, apparently made progress. The future may well bring increasing intensification and diversification of processing methods for natural asbestos, ultimately permitting the production of a variety of grades from one stock. All in all, the free world is not likely to encounter any serious problems in its peacetime asbestos supply during the next 25 years.

"At the same time, security considerations demand various precautions. The search for and development of domestic asbestos sources should be encouraged as should elimination of nonelectrical uses of strategic, low-iron asbestos. Continued and intensified research should be encouraged in substitutes for asbestos, the purification of long-fiber asbestos, and the possible building up of long fiber from short fiber."

INDUSTRIAL DIAMONDS

Industrial diamonds are of great strategic importance. Most of the world's diamonds come from the Belgian Congo and are marketed by a diamond cartel. Although the principal source of diamonds is remote, vulnerability is not regarded as critical as the Commission states the entire annual world production would constitute about a single plane load.

The Commission believes that efforts to eliminate the use of diamonds should be fostered. These include a controlled erosion of high-energy sparks to shape carbide tools, as well as the possibilities of developing synthetic diamonds. An ample stockpile is the principal means of protecting the United States under existing conditions.

MERCURY

Mercury is an important product both to the civilian and military economy. At one time, the United States accounted for as much as 80 percent of the world output. United States production has declined, and we have become dependent upon the production of Spain and Italy.

The Commission's views on the mercury supply are stated in full. It said:

"The current low level of mercury production in the United States largely reflects the exhaustion of reserves economically workable at world prices. The sharpness of the fluctuation of output is largely attributable to the great changes of demand associated with two world wars and the post-Korean developments. The fluctuations were probably intensified up to 1950 by operations of the Spanish-Italian mercury cartel, which at times maintained prices at levels that stimulated United States output, while at other times it threw large inventories on the market so that prices were depressed and United States output discouraged. The cartel was reported to have been dissolved in 1950. Since the Korean conflict began, the price has almost tripled, however.

"The United States has probably been explored more intensively for mercury than has the rest of the world. Current estimates of United States reserves total (measured, indicated, and inferred) about 375,000 flasks in ore averaging 10 pounds or more a ton. Another 1,150,000 flasks are estimated as contained in ores that run as low as 1 pound per ton. As these reserves are scattered in small deposits, many of which are difficult to mine because of the caving of previous operations, it appears unlikely that an annual domestic production of much over 10,000 flasks, on the average, can be reasonably expected. In an emergency, double this quantity might be extracted in each of a few years, but probably at the expense of drastically lowered output thereafter.

"Free world resources are evidently adequate to meet potential needs over the coming 25 years, without causing or requiring any substantial increase in the real price of mercury. It is possible, of course, that technological developments that introduce a large new demand could place an excessive strain on the resources in this small-scale industry. More important, however, is the possibility of cartel activity and the effect of such activity on the availability of mercury for the free world. Although the cartel was reportedly dissolved in 1950, the concentration of supply would permit its reestablishment at any time.

"United States resources are adequate to cover only a part of domestic requirements, and there is little likelihood of change in the degree of dependence on overseas sources. A stockpile has, therefore, been established to improve security.

"As long as Italy and Spain can produce mercury more cheaply than can the United States, it would appear reasonable, and consistent with the United States policy of economic cooperation, to import virtually all requirements. Meanwhile, this country is committed also to an anticartel policy; it is desirable, through international agreement, to prevent cartel restrictions and manipulation of supply, and to assure adequate supplies to all the nations of the free world."

It is difficult to understand how the Commission can suggest that we should become completely dependent upon Italy and Spain, in view of their knowledge of the operations of the mercury cartel. It is amazing that the Commission should state "it would appear reasonable, and consistent with the United States policy of economic cooperation, to import virtually all requirements." This statement is a death sentence for the domestic mercury producers who, during World War II, produced 20 percent of the world's total mercury supply.

The statements in this chapter on mercury clearly shows that the Commissions's bias toward assisting other countries forced it to make recommendations jeopardizing the security of this country.

The Commission refers to the desirability of an international agreement to prevent cartel restrictions and to assure adequate supplies. This, again, is an endorsement of chapters 5 and 6 of the repudiated Habana Charter.

MICA

Mica is a material of strategic importance for electronic devices, electrical motors, condensers, transformers, and electrical instruments. The principal problem in securing mica has been the tremendous amount of hand labor involved in processing, classifying, trimming, and splitting mica. Our principal supplies have been derived by imports from India, Brazil, and Madagascar. The Commission believes that the United States will not be dependent on imported mica by 1975 and that most mica will be derived from domestic sources. Its summary of the mica situation is given below:

"Developments during the past few years indicate that the next quarter century will probably see a far-reaching replacement of hand-processed mica splittings by mica built up mechanically, or possibly by synthetic mica or glass. Attempts at complete synthesis of mica have been only partially successful, but two United States concerns have developed processes to build up usable mica from scrap or waste. If commercially successful, these processes will replace some of the cumbersome splitting and reassembling processes presently performed by hand, and will open United States mica resources to mechanical operating methods. The development of high-temperature resistant plastics with good insulating properties has also made great strides in recent years; in addition, promising glass-fiber substitutes have been developed that may become important as replacements for some sheet mica in electronic uses.

"In view of all these promising developments it seems reasonable to conclude that by 1975 most mica will probably be derived from domestic sources and will consist of built-up material. For this reason, no attempt is made at estimating future levels of mica consumption, or the ability of the free world to meet such demands from reserves of 'strategic' mica.

"At present, certain grades of mica are being discarded to eliminate some of the processing steps. As green mica is not as predictable in its electrical behavior as is ruby mica, it is usually rejected, but more thorough testing would probably indicate that much of it is usable. It appears important in the short term, therefore, to develop suitable testing apparatus for evaluation of material. This would make possible the insistence on a wider acceptance of materials that meet electrical specifications but that heretofore have been discarded by what amounts to a rule of thumb."

QUARTZ CRYSTALS

Quartz crystals are an important component of electronic equipment. Brazil produces 99 percent of the world's output of quartz crystals. The United States has made great progress in producing synthetic crystals at competitive prices with the natural crystals.

The Commission is not concerned with a shortage of quartz crystals and, under these circumstances, has made no attempt to project the future level of demand and supply.

NONMINERALS

RUBBER—NATURAL AND SYNTHETIC—CHAPTER 20

The Commission expects the consumption of rubber to continue to grow, possibly double, over the next 25 years. It said:

"In the near future, total supplies of rubber are likely to be ample, but eventually there can be expected a growth of demand that will require construction of new capacity for synthetic-rubber production as well as the expansion of natural-rubber production.

"It appears evident that fundamental market forces, if permitted to operate, would bring about a market expansion in the production of both natural and synthetic rubber during the next 25 years. To the extent that natural-rubber production fails to keep pace with growing world demands for new rubber, and that the price of natural rubber is significantly above the real costs of synthetic rubber, the production of synthetic rubber can appropriately be expanded to make up the difference. This would tend to hold the world rubber price close to the real cost of producing synthetic rubber.

"The market forces can operate only indirectly on synthetic production, however, so long as synthetic rubber continues to be produced principally by the United States Government, and this factor must also strongly influence natural-rubber producers. Government production of synthetic rubber may operate in two ways to inhibit natural-rubber countries from expanding production: (1) To the extent that it leads to an administratively determined and somewhat lower price for synthetic rubber, it would reduce profit potentials on natural rubber; (2) it confronts natural rubber producers with the possibility of administrative price actions possibly more severe than normal market conditions would provoke.

"In much the same manner, private industry in this country would hesitate to build synthetic-rubber plants that might have to meet such competition from Government plants.

"If then synthetic-rubber production is to expand adequately and with sufficient rapidity, and without injury to the economies of the natural rubber producing countries, it should be allowed to take place through normal market forces. The synthetic rubber production expansion that would take place under such circumstances would be consistent with national security, provided the appropriate stockpiling policies are also followed. The Commission, therefore, concurs in the declared United States Government policy 'that the security interests of the United States can and will best be served by the development within the United States of a free competitive synthetic-rubber industry.' To this end, it appears desirable that efforts be continued toward an early disposal of Government plants and removal of Government regulations."

The above statement is of great importance. It clearly shows that, if synthetic-rubber production in the United States is conducted by private enterprise, market forces will insure adequate supplies and will allocate the proportion of domestic synthetic and imported natural rubber. The Commission is to be commended for this analysis as it precludes a rubber agreement, and instead looks toward the operations of the market to assure needed rubber.

The Commission sees no long-rang difficulty in assuring adequate basic materials for the production of synthetic rubber within the United States. It said:

"Present domestic synthetic capacity is over 1 million tons a year. This capacity can be expanded substantially by new-plant construction to keep pace with growing demands. Putting aside, for the moment, considerations of national security and possible future price and supply conditions for natural-rubber and synthetic-rubber production in other free countries, the basic factors that will affect expansion of synthetic-rubber production in this country are the availability of feedstocks (such as butadiene, styrene, and isobutylene) and the quality and performance of synthetic rubber compared with natural rubber. * * *

"It is evident that, with the more than adequate supply of synthetic feedstocks and improvement in synthetic performance qualities that may be expected, the growing demand for new rubber could readily be met by expanding synthetic-rubber production. It is, on the other hand, questionable whether the expansion in natural-rubber production, subject to the price competition of synthetic, and possibly affected by political conditions in southeast Asia, will keep pace with growing demand.

"While national security policies must affect the rate of expansion of domestic synthetic capacity, these policies can also be guided in part by market forces. At the end of 1951 the natural-rubber price was about double that of synthetic rubber (around 50 cents a pound compared with 26 cents for GR–S rubber), and the supply of natural rubber was short of total free world demands for new rubber. Whenever the price of natural rubber is significantly higher than the cost of synthetic, including recoverable return on the investment, the incentive to expand synthetic-rubber production will be strong. It is to be expected, therefore, that synthetic-rubber supplies will continue to be increased over the long run, and will competitively bring down the price of natural rubber to the price level of synthetic rubber, which in turn should, in the long run, remain close to synthetic production costs. This situation would of course, take hold after the next few years during which the world's new rubber supplies may be ample. Supplies currently available have induced a sharp decline in natural-rubber prices.

"If the synthetic rubber industry is in private hands, this general policy for gearing the rate of construction of new plants to the market prospects should occur on a fairly orderly basis as each producer adjusts to his market possibilities. Until the synthetic-rubber industry is in private hands, the governmental policy should follow the same general criterion of gearing synthetic production and the construction of new plants to the prospective demand for rubber at a price close to the cost of producing synthetic, subject, of course, to considerations of national security."

After the experience of the United States in losing its natural-rubber sources in World War II, security considerations are naturally of dominant importance. The Commission says:

"In view of the United States ability to expand synthetic rubber capacity, no serious security supply problem need be encountered during the next 25 years. If synthetic rubber capacity is expanded at a rate and volume close to the levels projected, a year or two should at any time enable the United States to build up any additional plant capacity needed for a war emergency. The national rubber stockpile, at goal level, would presumably provide supplementary supplies during the buildup period. The stockpile goal can, of course, be adjusted to changes in the relative dependence on imports, and to changes in the degree of substitutability as between natural and synthetic rubbers. Further the stockpile goal would be affected by the extent to which natural-rubber production is successfully fostered in Central and South America and in Africa.

"Should natural-rubber production fail to expand significantly, the United States and other free countries should increase synthetic rubber production at a correspondingly greater rate, and thus be closer to the plant capacity levels that might be required in a war emergency.

CHEMICALS—CHAPTER 21

The chemical industry provides the basic industrial materials for many of our other industries. The Commission shows that it has tremendous flexibility both in the raw materials it utilizes and in its processing techniques. The chemical industry in the United States assumed major proportion only after World War I. It has concentrated intensely on research and development. Heavy annual investments, both in research and development, have been made. The American chemical industry faces no long-term problems of raw materials supply. It differs from its counterpart in other countries where shortages of basic raw materials such as coal, petroleum, natural gas, lignite, and sulfur impede its development. The Commission shows that the so-called underdeveloped countries of the free world are hampered:

"Not only by lack of capital and technologically trained personnel, but, more importantly, by the fact that a chemicals industry must lean heavily on other industry, especially in its more complex operations. Power, transportation, steel and its alloys all are necessary before a large-scale chemical industry can be built. This is only possible when general industrial development has reached a suitable level. This is a slow process and may take much of the next 25 years to achieve."

The chemical industry in the United States has shown a great capacity for adapting itself to variations in raw materials and has also met many crises in our economy, such as the production of synthetic dyestuffs, fixed nitrogen, medicinals, synthetic rubber, synthetic fibers, quinine, and camphor. The commission reviews the prospects for the chemical industry in terms of the following broad questions:

"(*a*) To what extent can chemical products alleviate potential shortages of raw materials, and what does chemical technology promise in the way of new and superior products for the future?

"(*b*) What is the structure of the chemical industry and at what rate is the industry expanding?

"(*c*) In carrying on through the next 25 years, what drafts will the chemical industry make on the Nation's supply of basic raw materials and energy?

"(*d*) Although no long-range difficulties are envisioned for the next 25 years, what shorter range difficulties may the chemical industry encounter?"

It shows that:

"Virtually everything the economy requires in a material sense is related to the following six basic needs of mankind: (1) Food, (2) clothing, (3) shelter, (4) transportation and communication, (5) medication, and (6) tools, machinery, and equipment with which to work."

In foods, the Commission shows that "the big ultimate problem is more output per unit of land." It says that:

"Chemically, this general problem means enormous increases in the use of the basic plant foods—nitrogen, phosphorus, and potash; similar increases in the use of pesticides—chlorinated hydrocarbons in particular; greater use of protective films for packaging; and much more refrigeration."

In clothing, the Commission predicts a "continued supplementing of natural fibers by synthetic polymer fibers." It said:

"Fiber consumption in 1975 is projected to 7½ billion pounds as compared with 6 billion pounds for 1950. This figure was arrived at by projecting the average number of pounds consumed per person per year—approximately constant for over 30 years at 39 pounds—on the basis of expected population of 193.4 million people in 1975. For individual kinds of fibers, the 39 pounds was apportioned at 2.2 pounds per capita for wool, 20.2 pounds for cotton, and 16.6 pounds for rayon and other synthetics."

In housing, the Commission makes the following predictions:

"Much greater use will be made of glass products in insulation, building blocks, reinforced sheathing, and woven glass-fiber goods for curtains and wall coverings. Synthetic fibers, asphalt, synthetic rubbers, and plastics also will come into greater use—particularly in floor coverings. Less hardwood but more hard-

surface flooring will be used (polymers such as the vinyls). Wood will continue to be used, but it will be wood that has been chemically treated for longer life, greater fire resistance, and lower maintenance. The trend in sheathing and roofing will be toward compounded compositions, combining inorganic fibers with polymeric binders—making use of integral pigmentation and therefore less paint and lower maintenance. Ducts and piping will be plastic or plastic composition, and metal cabinets will give way to combination fiber-plastic ones.

"Housing of this type may be somewhat more expensive, but depreciation and maintenance will be far below present levels, thus preserving the owner's equity and possibly reducing his real cost, or at least providing a higher standard of housing at equal cost."

The Commission reviews the need of other industries as follows:

"One of the big developments of the next 25 years will be enormous construction programs for super highways, super airports, pipelines, rail rehabilitation, and coaxial cable and microwave radio relay for radio, television, and telephone systems. With respect to transportation, so far as the chemical industry is concerned, this means a tremendous demand for cement. For communication, the conducting metals, copper and aluminum, will continue to be used, but with plastic-metal sheathing and plastic dielectrics. Improved vehicles will be developed, using light metals and plastics together with glass-fiber reinforcing. Petroleum will be the basic fuel, but a given quantity will do much more useful work. The senseless waste of liquid fuel will tend to be reduced (particularly of unnecessary automotive horsepower is not further increased) as fuel efficiency increases."

Once again, the Commission continues its peevish criticism of what it considers excessive automotive horsepower.

The Commission reviews the contribution of chemistry to medicine as follows:

"The use of medicine of all kinds will greatly increase—though many of the old diseases (malaria, for example) will disappear. The trend toward chemotherapy will continue. New antibiotics, polymeric blood plasma substitutes, synthetic cortisone and cortisonelike substances, and many new chemotherapeutic agents will be produced. More medication will be taken for promoting good health than for curing disease. Here the quantitative drain on chemicals and basic materials will not be relatively great. A little will go a long way in terms of vitamins, minerals, antibiotics, and amino acid supplements."

It projects the needs of the capital goods industry as follows:

"For capital goods requirements, there will be greater use of glass and glass-lined equipments for piping, stills, and reaction vessels used in high-temperature operations. There will be new refractories withstanding higher and higher temperatures, using compounds of zirconium, vanadium, aluminum, boron, silicon, carbon, and other elements. Glass-fiber plastic combinations having the strength of steel will begin to be applied in industrial equipment. New carbon-fluorine and carbon-silicon plastics that can withstand high temperatures and artificial graphite pipes, rods, and shapes, will be increasingly used. Plastics, either alone or reinforced, will replace much industrial piping—especially where corrosion resistance is important."

"A projection has been made of total refractories and nonclay refractories other than silica, magnesite, and chrome. The refractories industry, though small now ($150 million in 1946), is extremely important to the metallurgical, glass, thermal power, and chemical industries, and especially so to nuclear operations. In addition, it is likely to achieve great importance in various new types of power units. These include gas turbines, jet engines, and rockets. High-temperature materials able to withstand temperatures of 1,000° C. to 3,000° C. for reasonable periods are needed in order to boost the thermal efficiency of these power units. Most metals soften at these temperatures, but ceramic-type refractories, either alone or coated on metals (cermets) have been found suitable."

"Although it is possible to estimate roughly the approximate increase in volume in the refractories industry, the demand for the specific materials that the industry will require is much more difficult to predict. This field is currently the subject of intense research by many universities and industrial and research institutions. The oxides that have been in use in the past include alumina, chrome, magnesia, and silica. Various others are now being investigated, including those of zirconium and thorium, and also carbides, nitrides, and borides of such elements as iron, hafnium, columbium, silicon, molybdenum, tantalum, thorium, titanium, and zirconium. In addition, various applications of graphite and carbon, of silicon carbide bonded with graphite, and of metals bonded with graphite are being made. Carbon hearths have been installed in a

considerable number of blast furnaces. Many different techniques of combining metals with refractories are also undergoing development. Stabilized zirconium oxide has found application as a new refractory with outstanding resistance to shock.

"Among the products that will be important in growth of glass production are glass building materials and glass wool and fibers. The latter, in addition to their uses in thermal insulation and in textiles, will expand in use as a reinforcing agent for plastics. An approximate doubling of glass production by 1975, to about 12 or 14 million tons, is projected.

"The projected production of cement is based on projected gross national product and anticipated building volume. Large-scale substitution of prestressed concrete for steel is expected. Total 1975 requirements for cement may be approximately 2.5 times present production, or about 5.5 million barrels per year."

The chemical industry has been an industry of great growth and one in which research has played a dominant role. The Commission discusses the structure of the industry as follows:

"The chemical process industry as a whole included 18,000 plants in 1947 and produced products valued at $35.4 billion. This includes such industries as rubber processing, petroleum refining, and paperboard manufacture. Without these, the total volume amounted to $22.7 billion.

"There are 40 companies in the United States producing chiefly chemicals and having sales of more than $5 million a year. There are also 6 additional companies making only rayon, and a number of petroleum companies and other large manufacturers whose products include a substantial proportion of chemicals. Finally, a number of the rubber companies are manufacturing synthetic rubbers and plastics and numerous other companies are making a wide variety of chemical end products.

"Total 1939 and 1949 sales of the 45 leading companies were $1.1 billion and $4.5 billion, respectively. Chemicals rose in price during this decade by 40 percent. The 1939 figure corrected for this price difference amounts to $1.5 billion. The 1949 figure thus represents a 200-percent increase in 10 years. During this period the Federal Reserve Board index of industrial poduction rose from 108 to 174, an increase of only 61 percent. This indicates a ratio of chemical growth to all industrial growth of 300 to 161 or 1.9. On the assumption that this relative growth will continue over the next 25-year period—that is, at about 2 times as great as that of industrial production generally—and as the total value of all goods and services is expected to double by 1975, this would mean that the chemical industry as a whole wil be about 4 times its present volume by then."

The Commission sees no long-range problem in the expansion of the industry through limitations on the supply of basic materials. It said:

"In general, no long-range bottlenecks are foreseen for the basic materials. However, some shorter-range bottlenecks, such as those experienced in sulfur and in benzene in 1950–51, may well be encountered. These will be considered in a discussion of the projections of individual commodities later in this chapter. Given time, there should be plenty of all the raw materials required for chemical industry, even though in some cases at a slightly higher cost. Careful attention must be given to the question of training scientists and technologists. A continued shortage here would be an especially serious impediment to the development of the industry.

"The aromatic chemicals (benzene, toluene, the xylenes, and phenol) are extremely important in the production of plastics, synthetic fibers, dyestuffs, medicinals, synthetic rubbers, and other products. None of these represents a long-term problem, but there is a definite short-term problem in relation to benzene and phenol.

"The 1975 requirements for chlorine are projected to be 8 million tons, 4 times those of 1950. Chlorine is widely used for chlorinating water supplies, in the pulp and paper industry, in the manufacture of various plastics, in insecticide production, and in the manufacture of solvents for degreasing metals. It has many other uses. One of the problems associated with its production is the fact that caustic soda is produced simultaneously, 1.1 tons of caustic soda being produced per ton of chlorine.

"The demand for caustic soda is not expected to increase at the same rate as that of chlorine. Hence, a readjustment in the uses of caustic soda may be necessary or some other solution to the problem may have to be provided to handle this possible surplus of caustic soda. The 1975 demand will probably not exceed 5 million tons.

"A projection of the requirements for soda ash, one of the most important materials going into the manufacture of glass, indicates that the requirements for this material will double in the next 25 years to 8 or 9 million tons. This should be no problem since the chief raw materials—salt, limestone, and coke—are plentiful.

"Requirements for benzene will be multiplied 8 to 10 times by 1975 from a 1950 output of 188 million gallons. Heretofore benzene has been recovered as one of the byproducts in the production of metallurgical coke by coal distillation. This source of supply has recently proved to be insufficient to meet requirements, and techniques have been developed to produce it from certain fractions of petroleum and natural gas, though at a higher cost. Benzene from petroleum is currently selling at about 32 cents a gallon. Practically all of it is under contract and not available in the open market. Imported benzene in 1951 sold at prices appreciably higher. Industry studies indicate, however, that there is little danger of a permanent shortage of this material, since there are several alternative methods for producing it. One of these is an expansion of the newer processes for its extraction from petroleum. The petroleum industry could produce all the projected requirements for the next 25 years. Another alternative exists in the possibility of hydrogenating coal chiefly for aromatic chemicals. This would produce large quantities of phenols, toluene, xylene, and naphthalene, as well as benzene, but again at relatively high prices. It seems clear that these aromatic hydrocarbons and phenols will be available in the quantities required in the future, but in order to get them the chemical industry will have to shift from its exclusive dependence on coke byproducts to these alternative sources, possibly at a higher price.

"This whole problem is intimately related to the production of liquid fuels. The direct hydrogenation of coal not only produces liquid fuels but also makes possible the production of substantial quantities of the aromatic chemicals. From the point of fuel production alone, direct hydrogenation is the most expensive of the three possible processes for the production of liquid fuels (coal hydrogenation, the Fischer-Tropsch process and the production of oil from shale), but credit for the aromatic chemicals might be sufficient to make a limited application of this process feasible. The cost of producing aromatics from petroleum by present processes would be an important factor in determining the future trend of prices and the effect of such prices on the economic feasibility of the various processes for producing liquid fuels.

"Since caustic soda is produced simultaneously with chlorine and no equivalent increase for it is expected, there will be the problem in chlorine production of utilizing the surplus caustic soda. The surplus of caustic soda may be further increased by the growing replacement of soap, which is a large user of caustic soda, by other detergents.

"The problem may be attacked by developing economical methods for the manufacture of chlorine that do not simultaneously produce caustic soda (along the lines of the Deacon process), new and economically sound uses for caustic soda, and possibly methods for converting caustic soda to soda ash. The last mentioned possibility would take care of most of the surplus projected for 1975, since a sufficient market for soda ash exists, but it would be at a somewhat higher cost for either chlorine or soda ash.

"This is a problem that the industry itself will handle as it becomes pressing.

"Another problem related to the substitution of soap by other detergents is the increase in the potential production of byproduct glycerin from soap manufacture and from hydrolysis of fats generally.

"Fortunately a process exists for making glycerin from propylene, a petroleum product. This process is now in large-scale operation and can be substantially extended. Also, research is in progress to make glycerin from some of the sugars. Here also is a problem that industry will be able to solve for itself."

Once again, it is quite obvious that the chemical industry, left to its own devices, can solve most of its problems. The phenomenal growth and development of our chemical industry was not a result of Government planning; it was the product of American enterprise and initiative.

BACKGROUND INFORMATION

PROJECTION OF 1975 MATERIALS DEMAND—CHAPTER 22

This chapter was written entirely by Dr. Harberger of Johns Hopkins University. As it supplies the estimates of materials demand in 1975 upon which the entire study is based, it is of particular importance to make a thorough and careful review of Dr. Harberger's premises. Volume I, which presents the Commission's recommendations on pages 9 and 24, shows the expected increase in the demand for selected materials over the 1950 consumption base. The figures shown in these charts imply a very high degree of accuracy in the projections. A careful reading of the methods used by Professor Harberger indicates that one is not warranted in taking these figures too seriously. On page 111 he says:

"The choice of policy depends, however, on the broad order of magnitude of the prospective growth rather than on the precise amount. For few if any of the materials under review would the appropriate policy be different if the materials demand of a generation hence should be 100 percent larger rather than 50 percent larger than at present. For example, if our resources would last 29 years at the lower of these 2 growth rates, they would last but 25 years at the higher rate; if they would last 11 years at the lower rate, they would last 10 years at the higher rate.

"Indeed, serious difficulties would arise if much more precision than this were vital to correct policy judgment. The forces that govern economic growth and development are themselves not regular enough to enable us to allege that a 60-percent growth is likely while a 75-percent growth is not. Accordingly, the projections of materials requirements presented below do not purport to be predictions but only indicators of the size of the problems the United States is likely to face."

The above quotation clearly shows that the Commission is most unwise in preparing its tables in volume I, where, for instance, it shows that the demand for zinc will increase 39 percent over the 1950 consumption base rather than 50 percent or 20 percent. If the policy recommendations contained in volume I would be different with other figures, then the entire report should be discounted insofar as it makes recommendations based on these trends.

Professor Harberger makes basic assumptions as to the working population and its productivity in the year 1975. He assumes the rate of productivity will be higher than it has been, although there is certainly no basis for such an assumption. He says:

"The number of hours per worker is expected to be reduced by about 15 percent, while product per man-hour is expected to rise at about 2½ percent per year. The assumed rise in man-hour productivity is somewhat in excess of the historical average rate of increase of 2.1 percent per year, but 'continued high employment, together with a rate of increase of capital per worker somewhat in excess of that which prevailed in the past quarter century, should make such growth feasible.' Much of the increase of output of the past 25 years was actually achieved in the 15 years 1935–50 in spite of the fact that the needs of the greatest war in history were in competition with the demand for producers' equipment.

"The joint result of the projected changes in the working force, in productivity, and in the average workweek is a doubling of total national output of goods and services (the gross national product) between 1950 and 1975. If productivity should increase only at its historical average rate, a doubling of gross national product can nevertheless be achieved with a reduction in hours less than we have assumed. We, therefore, consider it prudent to develop a materials policy consistent with a 100-percent increase in our total production over the next quarter century, recognizing that a level twice that of 1950 is almost certain to be reached at some point in the decade 1970–80. Readers may, in fact, view our use of the date 1975 as a shorthand means of denoting 'sometime in the 1970's.'"

Professor Harberger himself realizes the inadequacies in his approach in the statement given below which clearly shows the difficulties in estimating population:

"Total population a generation hence cannot be forseen with great accuracy. Current estimates for 1975 range from below 180 millions to over 220 millions. Because of the frequent use of per capita figures in cases in which the underlying relationship is to adult and not to total population, it was felt desirable to choose from the possible range of population projections a figure that approximately preserved recent ratios of adult population to the total. Such a figure is provided by a recent Bureau of the Census estimate, which, on the assumption of some decline in birthrates, sets the 1975 population at 193 millions. This estimate is 32 percent greater than the projected population 14 years of age and over, which is exactly the percentage by which total population exceeded population 14 years of age and over in 1947."

He expects the population in the United States to be 193 million in 1975, an increase of 27 percent over 1950 or 1 percent per annum. While these estimates were secured from the Census Bureau, they must be regarded as highly tentative in the light of the recent sad experience of demographers in predicting population levels. Professor Harberger assumes that one can predict the labor force from the population. He said: "Historically, the labor force, except for wartime emergencies, has constituted a remarkably stable fraction of around 56 percent of the population 14 years of age and over." Actually, between 1929 and 1941, the labor force constituted around 56 percent of the adult population. In the future, more married women will leave the labor force and, as the standard of living rises, eligible school and college enrollment will tend to decrease the number of younger workers. Furthermore, by 1975, people over 65 years of age will constitute a greater proportion of the adult population. This make it appear that the choice of 56 percent is too high.

Professor Harberger assumes a normal rate of 2½ million unemployed. This prediction also seems on the low side inasmuch as we will have a labor force considerably larger than at present, and we already have 3 million unemployed in a period when the gross national product is still very high. He discusses the basis for assuming a higher rate in the growth of productivity as follows: "Continued high employment, together with a rate of increased capital per worker somewhat in excess of that which prevailed in the past quarter century, should make such growth feasible." This is glib reasoning, which does not appear to be warranted by the facts at hand. In the first place, we cannot accept the implication that governmental action is capable of eliminating cycles from economic activity, and thus the idea that continued high employment will cause productivity to rise more rapidly in the future than in the past must be rejected. Also, there does not appear to be any clear-cut justification for Professor Harberger's conclusion that capital per worker will increase nationally at a rate higher than it has in the past. Indeed, if we assume as does Professor Harberger, greater and greater governmental influence over the economy, we should expect a decline in the rate of net productive capital accumulation. Also to compute 1975 productivity by moving foward 2½ percent per year from a 1950 base implies that 1950 productivity was normal, whereas in actuality it was probably cyclically high.

It is also perhaps true that in the future equal percentage increases in productivity will require relatively more capital than in the past. This follows because obvious and easily obtained gains in productivity are those accomplished first, and as time goes by, the easier and less expensive means of increasing productivity become more and more scarce. To raise national productivity 2 percent from a highly productive base (such as 1950) might well require relatively more capital than to raises productivity 2 percent from a lower level.

Thus, Professor Harberger's assumptions regarding productivity appear to be too high. A better guess appears to be that, if all goes well, productivity can be expected to continue to increase at about 2 percent per year.

He estimates that the gross national product will be about double that of 1950. This estimate is purely a mathematical product of the estimates of employment, hours per worker, and output per man-hour described above.

Since the estimates of employment and output per man-hour appear high, it follows that Professor Harberger's gross national product estimate is high. In accordance with the discussion above, a better estimate might be that gross national product in 1975 will be about 70 percent higher than that of 1950, instead of 100 percent higher.

He has assumed that the relative prices of different materials will maintain their 1950 standing, and that new technologies now unforeseen will not be developed. He said:

"If methods of production were to remain the same, the amount of a material used to produce a particular end product (such as rubber to produce tires) would grow in proportion to the output of that end product. Methods of production, in turn, can generally be expected to change only in response to changes in relative prices or in response to changes in technology. Since relative prices are assumed to remain at their 1950 levels, the demand for each material is projected to grow along with the demand for the types of products that the material makes, except where, for reasons other than relative price changes, substantial change in technology is anticipated. Thus, in projecting the demand for copper, it is necessary to ascertain how much of this metal was used in each of its major applications in 1950, and then to project the amount used in the production of automobiles and trucks in proportion to the projected demand for motor vehicles, the amount used on construction in proportion to the projected level of construction activity, and the like.

"This method disregards the potential incidence of new products, but it seems unwise to base materials policy on uses yet to be discovered, since nothing is known about what the new products of the future will be, what materials will be required to produce them, or how much they will add to the future demand for any material. They may even, by substituting for old products, reduce the drains on some materials, but again there is no basis for determining which materials will be thus affected nor by how much."

These assumptions are completely unrealistic. They have already been discredited in previous discussions.

Professor Harberger makes an excellent case for a free market in the following statement taken from page 112:

"The actual consumption of a material for any prolonged period is limited by the quantity that can be supplied. If, in a free-market economy, the amount of copper that people would like to consume at a specified price exceeds the supply forthcoming at that price, the price of copper will rise, dissuading some potential consumers from their desire to buy copper, and providing suppliers with an incentive to increase output. A gap between supply and demand thus exists only insofar as free-market forces fail to operate.

"Clearly, if this study were to attempt to predict actual consumption of copper and other materials around 1975, it would have to take into account the forces governing both supply and demand and would have to allow for the price adjustments necessary to equate the two. The real aim, however, is to attempt to answer the following question: How much copper, for example, would be demanded in the years around 1975 if the price of copper, relative to its close substitutes and to the general level of prices, were to be at its 1950 level? The actual course of events may thus belie the projections; if the amount that would be demanded at the 1950 price in 1975 exceeds the supply forthcoming at that price, the price that will actually prevail will be higher, and the amount actually consumed will accordingly be lower than the amount projected.".

Professor Harberger has actually discredited his own projections most convincingly in the above quotation. He explains the reasons for making these projections with the following statement:

"What service, then, may projections based on the assumption of 1950 price relationships perform? By indicating the probable extent of demand at these prices, they may enable the Nation to foresee potential price rises and either to forestall them by providing suppliers with an inducement to expand their capacity, where this can be done without much increase in costs, or to adjust to them in a rational and unhurried fashion when increased supply can be induced only slowly. In some instances long years of development must precede the opening of a new mine or the working of lower grades of ore; or a long period of conscious research may be needed before a material previously deemed indispensable can be rendered unnecessary."

Here, again, is the desire to foster a planned economy and to have decisions made by bureaucrats rather than by the initiative of private producers. Throughout the entire five volumes of the Commission's report, no evidence has ever been produced that the Nation suffered from a real shortage of materials due to lack of foresight by individual producers spurred by normal market incentives.

Professor Harberger, after completing his estimates on the size of the labor force, its productivity and the gross national product in 1975, proceeds to project the end products of this wonder world.

Professor Harberger attempts to forecast the composition of the gross national product in 1975. He said:

"If no changes were envisaged in the composition of the goods and services that together make up the gross national product, the projected increase of 100 percent in gross national product would imply an increase of 100 percent in all materials requirements. However, the composition of gross national product will surely change in the next 25 years. The long-term tendencies of growth and development are: (*a*) to increase the incidence of services in the expenditures of consumers, and (*b*) to increase the extent of fabrication that materials undergo before they find their way into final products. The first of these tendencies is somewhat obscured in available statistics, which show a decline in the ratio of expenditure for services to total consumer expenditures, from about 38 percent in 1925 to about 31 percent in 1950.

"The arguments supporting this proposition, on which are based many of the projections in this study, are given in the following pages first in general terms and then are expanded and illustrated by specific examples. Over the 25-year period that began in 1925, durable goods as a whole (gross private domestic investment plus personal consumption expenditures on durable goods) averaged 18 percent of the gross national product; in 1950 these components constituted 27 percent of the gross national product. Thus an increase of only a third in the absolute amounts of these components would succeed in restoring the average past ratio if, as we have assumed, gross national product is to double between 1950 and 1975."

Some of the obvious difficulties with this approach are apparent; for example, in discussing residential construction, Professor Harberger says:

"Residential construction is most closely related to the number of individual households. For 1975, 62½ million individual households are estimated, and it is assumed that there will be a dwelling unit for each household. Of these dwelling units an estimated 500,000 to 600,000 will have to be replaced in 1975, and an additional 800,000 to 1 million will probably have to be built for the net increase in household units. Thus somewhere between 1.3 and 1.6 million new units are likely to be constructed in an average year around 1975, or less than 15 percent more than the 1.4 million units built in 1950. The replacement factor in this projection assumes some reduction in the average life of a dwelling unit from its present estimated level of 75 years, as felt to be justified by the projected increases in levels of living. If allowance is made for possible increase in the average size of dwelling units and if there are no substitutions, the use of materials in residential construction may be projected as rising by between 5 and 25 percent. Public construction in 1975 is expected to be some 50 percent above its 1950 level, with the result that construction generally is projected to rise some 30 percent between 1950 and 1975."

Professor Harberger is assuming that at least a half million existing dwelling units will be demolished annually in 1975. We have never reached a rate of replacement where 100,000 housing units are actually destroyed each year. It is difficult to understand how a replacement level of 75 years applied to 62½ million units would only give a replacement market of 600,000 units. The arithmetic seems deficient.

In discussing automobiles, Professor Harberger said:

"Aside from residential construction it is in the consumer's durables field that specific commodity analyses can best be undertaken. The outstanding example is that of automobiles. At the beginning of 1950 there was in use in the United States 1 car for about every 3 persons 14 years of age and over. By 1975 there is expected to be 1 car to every 2 to 2½ persons over 13, or around 65 million cars on the road in the United States. Assuming the average life of a car to be 10 years instead of the present 12 years, the replacement demand for new cars in 1975 is estimated as between 5.5 and 6 million, to which must be added an additional 1 to 1.5 million to provide for the growth of population and incomes. The projected domestic requirement for automobiles is therefore between 6.5 and 7.5 million, an increase of less than 15 percent over 1950's total production of 6.66 million. No change is assumed in the size of the average automobile."

It is difficult to make any comments regarding the average life of a car in the year 1975. Certainly, one would expect the average life would increase rather than decrease, as manufacturers have constantly improved their product. The total projected domestic demand is only 15 percent over the 1950 actual production. It is difficult to see how Professor Harberger could justify the doubling of gross national product with only a 15-percent increase in the produc-

tion of automobiles. Actually the automobile industry has been one of the most dynamic in the economy and it has contributed in many ways to rising gross national product. Either the estimates on the doubling of gross national product are much to high or the projection of automobile demand is much too low. Professor Harberger attempts to justify these discrepancies by stating that production of durable goods in 1950 was abnormally high. He said:

"The fundamental economic function of durable-goods production is two-fold: to replace worn-out items and to expand the total stock in a fashion consistent with the pattern of growth of the overall economy. In 1950, and in fact in all postwar years, durable goods production performed even more. Since the war there has been a race on the part tof durable-goods production to meet the needs that it perforce failed to meet during the war years and to help the stock of durable goods to catch up with the wartime and postwar growth of the economy as a whole. Automobiles constitute the most striking example. If merely the fundamental long-term function of automobile production had been fulfilled, say in 1949 and 1950, the increase in the stock of cars would have been largely dependent upon the increases in population and disposable income. Yet more cars were added in 1949 and 1950 (over 7 million) than people were added to the population, and for this net increase there was probably spent more than the $15 billion (at (1950 prices) by which disposable income, in 1949 and 1950 together, exceeded the annual rate of $188.6 billion that prevailed in 1948."

Professor Harberger merely deals with the deferred demand of the war. Actually the depression years, with high unemployment, accounted for a large part of this deferred demand. On page 113, he said:

"The arguments supporting this proposition, on which are based many of the projections in this study, are given in the following pages first in general terms and then are expanded and illustrated by specific examples. Over the 25-year period that began in 1925, durable goods as a whole (gross private domestic investment plus personal consumption expenditures on durable goods) averaged 18 percent of the gross national product; in 1950 these components constituted 27 percent of the gross national product. Thus an increase of only a third in the absolute amounts of these components would succeed in restoring the average past ratio if, as we have assumed, gross national product is to double between 1950 and 1975."

It is difficult to make any generalization based on the 25-year period beginning in 1925, as it included at the most only 5 normal years—1925 through 1929. The remainder of the period was characterized by depression, war, and a war-induced boom. A restoration of the so-called average past ratio has little meaning. Professor Harberger, while assuming that demand for automobiles would only increase 15 percent, believes that the demand for plant and equipment will continue to grow at a more rapid rate. He said:

"The components that most directly and strongly influence the growth of gross national product are producers' expenditures on plant and durable equipment. These items provide the capital base on which industrial production may expand. Depending on whether the war years are included or excluded, the producers' durables part of this base averaged, in the quarter century prior to 1950, between 5.6, and 6.3 percent of the gross national product. In 1950 it was 9.5 percent of gross national product. An increase of less than a third above the 1950 level of these components, together with the projected doubling of gross national product, would restore by 1975 the same relationship between producers' durables expenditures and gross national product as helped to double gross national product in the past generation.

"Because the labor force is not expected to increase quite as rapidly in the next 25 years as it did in the past, somewhat more rapid growth of cooperating capital must be allowed in order to yield the same percentage increase in the total product. The producers' durables component is therefore projected as constituting about 7 percent of gross national product in 1975, as opposed to its somewhat lower past average figure. The projected rise in this component from 1950 to 1975 is thus about 50 percent."

This is a very curious line of reasoning. Professor Harberger assumes that producers' durables should constitute a somewhat larger portion of gross national product than has been the case over the last 25 years, "because the labor force is not expected to increase quite as rapidly in the next 25 years as it did in the past, so somewhat more rapid growth of cooperating capital must be allowed in order to yield the same percentage increase in the total product." Based on this reasoning it is concluded that demand for producers' durable equipment will be about 50 percent higher in 1975 than was the case in 1950.

The reasoning here seems to be that one economic factor will obligingly adjust itself to compensate for changes in another factor. There is no obvious justification for assuming that producers' durables will constitute a higher proportion of gross national product in the future than it has in the past. Also, it is felt that the estimate for total gross national product on which the producers' durable estimate is based, was probably too high. Consequently, it appears that the expected demand for producers' durable equipment is on the high side.

The statements which have already been made clearly show the inadequacy of the data upon which the projections of specific materials are based. Further problems arise when one attempts to use such projections to calculate quantities of specific materials. Professor Harberger is aware of these difficulties. He said:

"The following projections must be used and interpreted with great care, for they are conditional upon the meeting of explicit assumptions. Should the future invalidate the assumptions, the projections would require revision. But if future events produce important differences from assumed quantities or forces, they are quite likely also to produce patterns of materials demand substantially different from those projected. The crucial assumptions concern prices and techniques. The projection of raw material needs as growing in proportion to the demand for end products has been justified on the assumption that no price changes would occur that would induce significant substitutions of one material for another by producers, or of one end product for another by consumers, beyond such substitutions as are clearly in sight."

"It has been further assumed, unless otherwise explicitly stated, that techniques of production do not change. Changes in technology that appear highly likely have been projected as taking place within the next 25 years; others, whose "wrinkles" have yet to be ironed out, have not been allowed for at all. Readers who wish to estimate the quantitative effect of a technological change that has not been taken into account may do so by turning to the end-use breakdown of the commodity involved and reducing the projected requirement for the end use by the saving they expect to be accomplished by the new technique.

"The allowances made for military requirements are quite arbitrary. Where munitions uses appeared in end-use breakdowns of materials consumption, they were projected as doubling; aircraft uses were projected as increasing fourfold. But these two categories do not represent the total of military requirements, and in the breakdowns for some materials, even these uses do not appear. Although some neglected items may be minor, others (such as atomic energy uses) may not be. The problems of projecting military requirements for long spans of time go far deeper than the inadequacies of available data, however. Future overall military needs depend more on the nature, scale, and location of a possible war than on economic aggregates rigidly defined, and there is little basis on which to project these factors. Furthermore, the technology of warfare changes so rapidly that the raw materials needed for future defense cannot be predicted. The defensive strength of the United States can be expected to grow as its productive power grows, but the commodity composition of the growth cannot be foreseen. The token projections of military end uses should therefore be accepted as invitations to the sophisticated reader to make such allowances as appear necessary with respect to specific military problems.

"The aim in making the projections has not been to draw a detailed picture of the future—an impossible task—but to help policymakers to decide among alternative courses of action. For this purpose a broad picture of likely future trends suffices. For many materials there is a wide range of possible rates of growth of demand that are small enough that no positive action is necessary, and another wide range of conceivable growth rates so large that in the absence of policy action serious problems would confront the Nation. In many cases it may be highly useful to know that demand is not likely to more than double in the next generation; in others, it may be equally important to ascertain that even under the most favorable of prospective technological developments, requirements at recent prices are unlikely to be reduced to parity with the foreseeable supplies. Above all, these projections are highly useful for estimating how rapidly this Nation is likely to be drawing upon its mineral reserves. For the most critical materials—those whose commercial reserves are closest running out—the precise rate of growth is the least important; ranges of error as high as 25 or 50 percent can often be easily tolerated without altering the appropriate policy conclusions. With respect to these particular materials, the reader can be most confident in using the projections. Where a very high degree of discrimination is required of the projections, they had best be left unused.

"By the use of intelligent analysis, it is possible to trace the broad outlines of the shape of things to come. But a wide range of uncertainty remains as the inevitable attribute of the future. We can do no more than recognize this certainty and provide as best we can, within the limits of what we are able to foresee, for the contingencies that lie ahead."

Unfortunately, most citizens will only read the Commission's recommendations and ignore the fine print given above which qualifies the data from which they were made. No attempt will be made to review projections for each material, but a few of the more obvious inconsistencies and omissions will be discussed.

In discussing the demand for lead, the statement given below is taken from page 121 of volume II:

"The use of lead in gasoline is projected to expand more rapidly than gasoline itself, since it is expected that a greater proportion of future engines will require antiknock fuel."

However, page 14 of volume IV said:

"A unique problem in substitution exists in the case of tetraethyl lead. Its function in obtaining high octane liquid fuels is a completely nonrecoverable use. No satisfactory substitute for tetraethyl lead has so far been found but a combination of factors may ultimately prevent serious expansion of its use, and possibly in the long run eliminate the necessity for it altogether:

"(*a*) Improved refinery practice can over a period produce higher and higher octane fuel without tetraethyl lead;

"(*b*) By improved engine design, such as the 'turbulent-fuel-intake' and the 'squish' piston, can increase the octane number from 80 to 100;

"(*c*) Additions such as boron or silicon compounds reduce the octane rating needed in the fuel as does cleanliness of the cylinders; and

"(*d*) Internal combustion engines may in the long run be replaced by other types which do not require high octane fuel. The increasing use of turbojets will decrease the employment of this fuel in military aviation and later in civilian aviation, as will the increased use of diesel engines in trucks."

It is quite obvious that the writers of volume II and volume IV never quite got together.

In discussing the demand for tin on page 122, the following statement is made:

"Babbitt metal (used for bearings) is expected to grow by the weighted average of the projected growth rates of automotive vehicles and railroad cars."

The Commission was apparently unaware of the fact bearings have been getting thinner and that the use of tin in automotive bearings has shown a marked decrease and will probably continue to do so.

In discussing antimony, on page 122, this statement is made:

"Use of antimony for bearing metal and bearings is expected to expand at the weighted average of the growth rates for automobiles, trucks, and railroad cars; that is, between 60 and 70 percent over the next 25 years. The projection is based on an assumed 1950 consumption of 2,500 short tons."

If the railroads continue to adopt ball and roller bearings, the consumption of antimony on railway cars will drop materially. The use of antimony in automobile bearings has also dropped and will continue to do so as bearings are much smaller and thinner than they used to be.

No consideration is given in the discussion of antimony to its possible use as a plating material where it may have possibilities as a substitute for nickel. Should present experimental techniques be perfected, this could change the demand for antimony.

Professor Harberger and the Commission have made very specific and definite statements as to the expected expansion in the demand for aluminum; yet the text written by Professor Harberger, on page 123, says:

"Aluminum has not yet found its 'normal' relative place in the materials demand of the American economy. In almost all its uses it is in the process of winning markets away from competing materials, as already cited in the discussions of the other nonferrous metals."

"This fact frustrates any attempt at precision in the estimate of aluminum demand. If there were no substitutions at all in favor of aluminum, its demand would probably expand by 1975 to 2 or 2½ times its 1950 level."

"We have chosen to project the 1975 United States demand for aluminum at 4.5 million (between 4 and 5 times the 1950 consumption) as indicating a plausible rate of growth. A figure much less than this would imply almost no incursions of aluminum into fields now held by other materials. A figure much greater,

say 10 times the 1950 output, would be possible if aluminum were assumed to take over more than a small part of the functions now performed by wood and steel. The policy implications of a tenfold increase should therefore be considered."

Volume I states that the increase in the domestic demand for aluminum over the 1950 consumption base would be 219 percent. In view of these statements, it is quite obvious that there is no justification for reporting results which give the impression that all three figures are significant. In this instance, the increase might be 500 percent instead of 200 percent, in which case not even 1 of the figures is significant. It is also surprising that the discussion of aluminum makes no mention of the possibilities for extensive substitution of aluminum for other materials by the automobile industry.

In discussing steel, military uses are dismissed with the following statement: "Military and atomic uses of steel in 1975 cannot be foreseen. Their projected doubling is merely an indication that they are likely to grow under conditions of continued cold war. They may not be as large in 1975 as in 1951–53, a period in which the military demand is expected to be largely devoted to the rapid increase of stocks of equipment rather than to replacement and 'normal' growth."

Again, this statement is sufficiently vague that one could pick almost any figure that comes to hand rather than the figures used by the Commission. The discussion of steel again completely ignores the possibilities of substitution by the automobile industry which is really its largest market.

Glass and plastic bodies are already an actuality and one would be bold to prophesy on the applications of these materials by the automobile industry in 1975. The possibility of substituting aluminum and magnesium in many parts of the automobile may also change the demand for steel and, at the same time, increase the demand for these alternative materials. The decision as to which material will be used is again one of engineering and economics. Automobile manufacturers are interested in the lowest cost of the finished product for a given standard of performance. It must be remembered that the cost of material is only one factor. Tooling, handling, and processing costs may often exceed the cost of the raw materials many times over. In other cases, the gain in performance achieved by substituting materials may give a competitive performance advantage in the end product, which would justify a shift even with an unfavorable cost picture.

The report discusses the demand for additive metals but there is no mention of the use of boron steels. It is possible that by 1975, the demand for many of the scarcer additives may be markedly reduced through the more widespread adoption of boron steel. Minute quantities of boron may replace large amounts of expensive additive metals such as nickel and chromium.

In discussing rubber, Professor Harberger says that: "This projection neglects possible increases in the durability of the average tire, since such increases are likely to be counterbalanced by an increased rubber content."

There is no evidence from the past that the present durability of tires was achieved by increasing the rubber content. The substitution of nylon and rayon for cotton, changes in tire construction, and better design, as well as differences in compounding the rubber itself, have accounted for most of the improvement, and developments such as these will be responsible for future progress as well.

In discussing energy fuels, Professor Harberger says: "Although it is recognized that the demand for the three fuels is highly sensitive to price, it is assumed that their relative prices remain unchanged. Hence, the relative shares in those uses in which they compete closely also are assumed to remain unchanged. Readers should, however, be aware of the vulnerability to even small price changes of the projected levels of demand for any of these fuels in such uses."

To formulate projections upon the assumpton that prices will not change, when it is clearly recognized that they probably will change, makes very little sense.

In discussing the demands for motor fuel, Professor Harberger says: "The projected increase in motor fuels assumes that the average fuel consumption per car, truck, and bus remains constant. Sixty percent of the motor fuel used in 1950 was consumed in passenger cars; it is projected as increasing by 75 percent."

Most of the passenger cars in use in 1950 were prewar models. The automobile industry has made phenomenal improvements in fuel economy in its more recent models and the trend is for even greater economy in the future. As the prewar cars are replaced by newer models, there can be no question that the average consumption per car will decline.

In discussing natural gas, Professor Harberger said: "Industrial use of natural gas is assumed to expand along with gross national product. This projection depends to a great extent on the validity of the assumption that the relative shares of the major fuels in the market for undifferentiated energy remain the same. Because of the responsiveness of the undifferentiated energy market to price differentials, this projection is subject to a particularly wide margin of error."

This projection again is completely unrealistic, as it is based on assumptions which the professor himself realizes probably will not materialize.

The difficulties of estimating domestic demand in 1975 are great and the possibilities of error in Professor Harberger's projections have been clearly shown. He is not deterred in attempting to project the demand for all the other nations of the world even though he realizes that adequate data for such an attempt is not available. On page 131, he said:

"It is assumed that in Europe, the United Kingdom, Canada, Australia, New Zealand, and Japan, productivity per man-hour may expand as rapidly as in the United States. In Canada, Australia, and New Zealand, where living standards are presently comparable to those in the United States, it is assumed that the number of hours worked by the average member of the labor force would fall by the same percentage as projected for the United States. For the European countries, where present levels of consumption are significantly lower than in the United States, a somewhat smaller percentage reduction in the average hours worked is assumed. In Japan, productivity per man-hour is expected to rise more rapidly than in other developed countries, owing to the underutilization of productive capacity in 1950; average hours worked are not expected to fall since they are already low. Japanese workers have much to gain before they attain a consumption level equal to that prevailing in other industrial countries. Labor forces have been estimated from population projections provided by the Department of State, by assuming that the labor force in each country remained at a constant percentage of the total population between the ages of 15 and 65.

"Limitations of both time and data have prevented as detailed an analysis for the rest of the free world as was made for the United States. The projections for the rest of the free world are accordingly even rougher approximations than those for the United States."

The qualifications on the projections given above make it quite clear that the Commission was most misleading in its discussion of the percentage increases over the 1950 consumption base for other free-world nations given on pages 9 and 24 of volume I. Those projections imply a degree of accuracy which the facts do not, in any way, support. No attempt will be made to discuss the projections for individual materials for the rest of the free world. It should be noted that they are based on 1950 data secured from the International Materials Conference. The International Materials Conference did not attempt to project materials demand 25 years ahead. They confined their efforts to the less ambitious project of predicting what would happen in years not later than 1956. Without exception, every prediction made by the International Materials Conference in its report on operations written in 1952 has already failed to materialize. With a 100-percent record of failure in making these more limited forecasts, one should not give too much credence to the more ambitious projections of Professor Harberger for the year 1975.

This chapter was compiled entirely by the Geological Survey and the Bureau of Mines of the United States Department of the Interior. It is in marked contrast to the remainder of volume II, in that every estimate is carefully qualified and the experts who prepared it took great pains to indicate the qualifications which should be used in appraising their work. A careful review of this chapter shows that it was given little consideration by the Commission when it wrote its conclusions and recommendations in volume I.

The introductory remarks in this chapter indicate how this material was prepared. The following quotations are relevant:

"The following statements have been prepared by commodity geologists of the Geological Survey, with the collaboration on production and economic factors by commodity specialists of the Bureau of Mines.

"The assignment was undertaken with the understanding that while adequate data on measured and indicated reserves might be available for domestic resources, comparable data on inferred reserves and other potential sources would not be available and the data on foreign resources would be deficient for all categories. The commodity sections that follow may be said, therefore, to contain the best 'informed guesses' as of today, but they do not reflect the present trend of reserves, which is a more vital factor from the standpoint of national welfare."

The authors of this chapter were very careful in defining what they meant by "reserves." They said:

"Therefore as used herein the term 'mineral reserves' refers only to the material that in some degree has been inventoried in terms of commercial enterprise. It is material that can be mined, processed, and marketed without financial loss under the economic and technologic conditions prevailing at the time of the inquiry. It includes all material at and above the economic and technologic margin known as the 'cutoff grade.' It does not contain material of submarginal grade which, with improved economic conditions, may become a reserve, nor does it include off-quality material which cannot be treated satisfactorily under current technologic practices.

"Reserve estimates apply only at the time and under the conditions prevailing when the estimates are made. As costs or market price fluctuate up and down, or as technology is improved, so also does the cutoff grade fluctuate. Thus the reserve is a constantly changing factor, for at all times there is present in by far the greater number of deposits material of submarginal grade or material of a quality unsuited to the production practices of the day. A technical fact to be kept in mind too is that cutoff grade differs from district to district and even, sometimes, from mine to mine, depending upon the complexity of local factors that influence cost. Estimates of reserves on a national scale then include blocks of diverse geographic origin and having diverse cutoffs; the national estimate does not have a cutoff of its own.

"The reserve problems and the probable means for their solution vary from commodity to commodity. For example, a submarginal material may contain larger percentages of the metal or mineral sought than is available in currently mineable ore, but the presence of a deleterious impurity or the physico-chemical form in which the metal or mineral occurs may make the apparently richer material unworkable under present practices. If the lowering of grade is due merely to a wider scattering of the same ore mineral in the enclosing rock, such as in the change from vein to porphyry-type copper deposits, the production problem involved for the lower grade material may be largely one of cost and may not involve radical changes in processing. In other commodities the differences between types of material may be great, as between bauxite and high aluminum clay and anorthosite—all of which are possible sources of aluminum. Under these conditions processing procedures become a very vital part of the production problem."

These statements show that the actual reserves of the United States cannot be put down as a figure on a piece of paper. They are dependent on technology, and vary from day to day as practices change and new techniques are developed. Certainly, at the turn of the century the copper reserves of the United States were largely those found in the Upper Peninsula of Michigan. They have long since been largely depleted, but technology has made the then submarginal material of Utah and Arizona our principal copper reserves. Who would be so bold as to prophesy that similar developments will not take place in the future? Certainly the authors of this chapter are not putting themselves in that position.

The authors of this chapter were well aware of the influence of price. They said:

"An increase in market price alone may influence the situation in a number of ways. It may stimulate immediate production from deposits already developed; it may bring into production entirely new deposits or parts of deposits heretofore noncommercial; or it may lead to the building of new plant capacity. It may also lead to an improvement in the reserve situation by stimulating the search for new deposits and by giving impetus to technologic research, which in turn may result in the development of new or improved techniques that may make off-grade or entirely new types of material amenable to use."

They were extremely careful in qualifying their estimates, as follows:

"As indicated above, these studies were designed to estimate, in the light of present knowledge, the commercial reserves and also the submarginal or off-quality material of a selected group of commodities and to estimate the market price that might be needed to make the mining and processing of the submarginal or off-grade material commercially practicable. If adequate information on costs and long-term rates of discovery were available, it would of course be possible to estimate the grade-tonnage and price-grade relationships. Because of deficiencies in data, however, it was not found possible to give these phases of the problem adequate treatment. Nevertheless, when the concept of reducing grade to a fraction of present commercial ore and of raising prices to several times the present level is taken into account, the different materials eligible for consideration as possible future sources are of course greatly increased. The reports deal in part therefore with materials now classed as marginal and submarginal and in some instances even with materials of much less economic promise.

"The use of materials classed as 'marginal' and 'submarginal' primarily awaits more favorable prices, whereas utilization of most of the material classed as 'potential future sources' must await new—in some cases revolutionary—technologies as well. None of the deposits included in these categories are now considered by industry as ore reserves. Nor are they so treated herein. It is recognized, however, that in certain instances these materials contain some of the greatest potentialities for future sources of supply even though they cannot be tapped economically by existing mining and metallurgical methods.

"Appraisal of mineral resources on a national scale is a relatively new kind of endeavor. Skills and techniques are still in the making. In any event, however, inasmuch as ore reserves are always partly hidden in the ground, estimates will always have a large margin of error. No estimate of reserves is ever to be considered exact in the usual meaning of that word even for the time at which it is made. Measured ore, by definition, may have a margin of error of as much as 20 percent. In practice this allowable maximum tends to become the rule. The margin of error in estimates of indicated ore is even higher, and for inferred ore higher still. Thus, for estimates that include all 3 categories, the margin of error commonly is in the order of 50 percent, but in reports of this sort the error may be even greater. This margin of error may be either plus or minus, although both the historical record and the usual conservatism of engineers and geologists suggest that on the whole estimates of reserves are likely to be conservative.

"By and large, then, the reserve estimates presented here are regarded as being of the correct order of magnitude. The estimates of submarginal materials and potential resources on the other hand are little more than informed guesses, for there has been little commercial incentive to undertake the expense of investigating such materials. The reader is cautioned therefore that none of the figures represent data than can be substantiated in detail. Hence, it would be unwise and in some instances grossly misleading to use these figures separately from their supporting and circumscribing texts."

If all of the conclusions, recommendations, and beliefs of the Commission had been as carefully qualified, there would have been little to criticize in the work of

this Presidential Commission. In fact, it would not have been necessary for Commission members to have fallen back upon an explanation of the difference between the words "believe," "conclude," and "recommend" in their discussion of the work of the Commission before the American Mining Congress at Denver in September of 1952. (See appendix on American Mining Congress.)

Only a very limited attempt will be made to discuss the comments on any specific materials. In discussing copper, on page 144, the experts from the Department of the Interior said:

"Many undiscovered deposits certainly exist under comparatively thin covers of rock or valley fill, and scientific advances should lead to the discovery of some of them. It is particularly certain that the ordinary course of mining operations will continue to find new ore year in and year out in established mines and districts. Over the years, the American copper industry has managed to find each year as much ore as it mined, in spite of an expanding production. As a result, the absolute value of reserve estimates has been gradually increasing, while 'years' supply in sight' has tended to remain constant."

This paragraph clearly shows that the future may be very bright for the American copper industry. In fact, instrumentation has been already developed, as discussed elsewhere in this report, to locate hidden ore bodies and a new copper mine has already resulted from this invention.

The remarks on foreign deposits of copper are of interest. The report says:

"Major foreign deposits are of much higher grade than those in the United States. Few, if any, of the large American deposits could be worked profitably if situated in Northern Rhodesia or Chile. Political stability, nearness to markets, adequate power, transportation, skilled labor, and competent management have, until now, been on the side of the domestic deposits."

The unfavorable factors cited above, under wartime conditions, would make our dependence on such deposits rather tenuous.

The experts discussed lead on page 150. Although supposed experts, both here and abroad, have predicted the exhaustion of the world's lead deposits before many years, the remarks quoted below clearly show that the authors of this section are not ready to write off the world's lead supplies, or even our domestic supplies:

"An estimate, made in 1944, of domestic lead reserves recoverable at or near then prevailing prices, showed 7,750,000 tons of metal in the ground, of which 5,150,000 tons was inferred. This was sufficient to supply the country for 13 years at an annual rate of 500,000 tons of recoverable metal. A similar estimate made in 1950 indicated 8,340,000 tons of metal still in the ground, or sufficient lead to last the country for 14 years. Thus, the estimated number of years of lead supply remaining increased 1 year, despite 6 years of production (at an average annual rate of 388,000 tons instead of 500,000 tons). The 1950 estimate can be accepted for 1951, though the past history of lead estimates suggests that the actual figures are only an indication of the minimum."

"As compared with zinc ore, a lower grade of lead ore can be worked because of cheaper smelting charges and also because the lead usually carries appreciable silver. Below 7 percent grade there is an increasing tonnage of lead contained in submarginal ore, but the total quantity is believed to be no greater than the 8,340,000 tons of commercial ore estimated. The margin of error in the submarginal estimate is much greater than for the estimate of commercial ore."

The Department of the Interior experts discuss the situation for manganese on page 155. They portray the outlook for the future as follows:

"Although none of the deposits can be mined commercially under present prices the low-grade manganese resources of the United States are sufficient to meet present and anticipated requirements for many years. However, a delay of at least 2 years must be anticipated between the beginning of their development and full-scale production. For this reason it is essential from the point of view of national security to maintain a large stockpile of manganese ore. Moreover if periods of international tension are protracted, this probably should be supplemented by construction and maintenance of standby plants sufficient to supply a substantial part of our requirements.

"It is probable that increasing industrialization in such countries as India and South Africa will cause those countries to retain a larger part of their production. The United States, therefore, cannot expect to continue to receive 50 percent of the manganese produced by the free world as it has since the Second World War. This trend indicates the desirability of encouraging—even subsidizing if necessary—the recovery of manganese from open-hearth slags, and in the long run, indicates that we may eventually be forced to develop some

of our low-grade resources even if world trade should continue relatively free."

Again, it would be foolhardy for anyone to suggest that some day we will not find a way to use the vast low-grade manganese deposits within the United States.

The experts discussed sulfur on page 158. They said:

"The multiple sources of sulfur give the sulfur-producing industry a flexibility unusual among mineral industries. The type of sulfur-bearing material used has changed from time to time as relative costs and availability have changed. In the United States consumption has fluctuated principally between sulfur and pyrites. Sicilian native sulfur was the preferred material until about 1890, domestic and Spanish pyrites until the First World War, and gulf coast native sulfur since then. At present nearly 85 percent of the sulfur consumed in the United States comes from the gulf coast native-sulfur deposits, about 10 percent is derived from pyrites, and the rest is recovered from smelter and industrial gases.

"About three-fourths of the sulfur used in the United States in 1949 was converted into sulfuric acid. After the First World War many acid manufacturers adapted their plants to native sulfur, because it was cheaper and more convenient to ship and use than pyrites. The abundance of cheap native sulfur has inhibited the use of byproduct sulfur from smelter and industrial gases or from sulfide ore mining operations. But now with the current shortage of native sulfur, the mining industry and acid manufacturers are showing greater interest in pyrite and other marginal sources of supply. It can be expected that the market for these sulfur-containing materials will widen during the coming years.

"It is generally agreed that there are ample reserves of sulfur-bearing materials in the United States and the rest of the world to supply any probable future demand. However, the bulk of these reserves is contained in deposits that have not been economically workable owing to the availability of cheaper high-grade sulfur. Various processes for treating the marginal sulfur sources are available, and further technologic improvements are in progress. The problem, therefore, is primarily economic."

The authors of this section clearly show that there can be no such thing as a sulfur problem if market forces are permitted to operate. It should be remembered that when this material was written, the United States was accepting allocations of its low-cost sulfur by the International Materials Conference. The prices were set artificially, so that no economic solution to the problem could possibly occur.

The discussion of petroleum, on page 165, is particularly noteworthy. The authors show the qualifications on the definitions of "reserves" established by the American Petroleum Institute. They say:

"Reserves of petroleum are always reported as proved reserves which are defined as follows by the American Petroleum Institute:

"'Proved reserves include only oil and natural-gas liquids recoverable under existing economic and operating conditions. They do not include:

"'(1) Oil (liquid hydrocarbons) under the unproved portions of partly developed fields.

"'(2) Oil in untested prospects.

"'(3) Oil that may be present in unknown prospects in regions believed to be generally favorable.

"'(4) Oil that may become available by secondary-recovery methods from fields where such methods have not yet been applied.

"'(5) Oil that may become available through chemical processing of natural gas.

"'(6) Oil that can be made from oil shale, coal, or other substitute sources.'

"As estimated by the American Petroleum Institute, proved reserves in the United States were 29.5 billion barrels on January 1, 1951. This estimate is the largest in the history of American oil exploration and development."

The authors continue by showing that, in spite of a constant increase in our usage of petroleum, our reserves are growing at an even faster rate:

"The estimates by the API are prepared from geologic and engineering data obtained by the petroleum industry in the development of producing fields. Exploratory drilling and the discovery of new areas, application of secondary recovery methods in old fields, and the utilization of new and more efficient production techniques are continually adding to the increasing volume of proved reserves. New fields discovered each year add to the proved reserves, and new discoveries in regions little explored are of particular importance in considering

future reserves. For example, the discovery of oil in commercial quantity in the Williston structural basin in North Dakota in April 1951 opened possibilities of finding oil-productive areas throughout a large area which may result in substantial additions to our known reserves. The discovery of oil in reefs of Pennsylvanian age in Scurry County, Tex., in 1941 and the subsequent development added 2.5 billion barrels to petroleum reserves of the country.

"If the present price of crude oil should be increased 2 to 4 times, the economic limit of the productive life of stripper wells in the older fields would be prolonged by as much as a quarter century. Their premature abandonment would be prevented and secondary recovery operations such as gas or air drive and water flooding would be encouraged.

"The older fields, under primary production methods, will have produced on the average 25 to 30 percent of the total oil in place prior to abandonment. Another 25 percent may be produced by present-day secondary recovery methods depending upon type of reservoir. Thus, approximately 45 to 50 percent of the original oil in these old fields is not recoverable by methods now in use.

"However, fundamental research may be expected to determine the nature of the forces that so tenaciously hold this unrecoverable oil in the pores of the rock and to open the way to the recovery of a greater percentage of the contained oil. The addition of 3 to 3.5 billion barrels of oil to the proved reserves in the United States may be expected through the further application of secondary recovery methods that are now in use, as indicated by production histories in three oil-producing Appalachian States from the period 1925 to date. Certainly the possibility of increasing the known reserves of the United States and by inference the known reserves of the world by one-eighth is an important element in the reserve situation.

"For example: A West Virginia field was discovered in 1906, produced a total of 705,000 barrels and was abandoned in 1923. In 1927, secondary recovery operations were started, with both air and mixtures of air and natural gas used for injection. It is estimated that an additional 357,000 barrels of oil have been produced as a result; i. e., an additional 50 percent recovery of oil has been obtained. Further, it has been estimated that an additional 460,000 barrels of oil can be recovered economically by water flooding."

The operations of the price mechanism are set forth effectively in the following, which is taken from page 168:

"The effect of any specific price increase on reserves of petroleum or substitute fuels is not subject to precise measurement. Price increases, even of relatively small extent, tend to encourage exploratory activity and thereby increase reserves, while price decreases have the reverse effect. Roughly, when reserves decrease toward the point where the optimum production rate will be insufficient to supply the needs of the economy, prices rise; the prospect of increased income from production causes increased exploration until productive capacity is excessive to demand when prices decrease sufficiently to discourage further intensive search for oil. In addition, many other factors constantly enter into or bear upon this reaction.

"The increasing demand for petroleum products, accompanying the depletion that will eventually result in a decreasing production of crude oil, directs attention to a number of other elements: Foreign supplies of oil, extraction of oil from natural gas, oil shales, and tar sands, and synthesis of oil from coal or agricultural wastes. The technical knowledge of these various processes is available today. The cost, either in dollars or materials, of installing them has not been justified because of the continuing availability of petroleum at relatively low cost. As the declining supply of petroleum at some future date increases the cost of oil, and as technological improvements reduce the cost of production from alternate sources, these other sources will come into use. Changing relationships in these costs make it impossible to say that any one of them will come into play when petroleum prices reach a certain level or at any specific time.

"Traditionally, a variation in the price of oil of 25 cents per barrel or even less has been sufficient to produce a noticeable change in rate of exploration and discovery. Furthermore, any substantial increase in price would justify exploration for and development of oilfields, which because of their remote location or extereme depth are not economically justified at the present price range. In the field of exploration, increasing technical knowledge and development of improved equipment are constantly increasing accuracy while better equipment and drilling techniques are enabling the industry to drill deeper and deeper wells in the search for oil."

The authors of this section are fully aware of the security problems implicit in unrestricted oil imports. They say:

"During 1950, approximately 12½ percent of the total United States supply of oil was imported. Relatively low production costs in foreign areas (principally Venezuela but with the Middle East increasing in importance) more than offset the transportation costs and import duties involved so that foreign oil could be supplied to the United States at a cost competitive with domestic oil. A policy has been developed by mutual agreement within the oil industry, and between the industry and Government, that imports will be utilized only to supplement and not to supplant domestic production. This policy has developed as a result of the necessity to maintain a high rate of productive capacity in the United States to provide against possible loss of foreign sources in time of emergency.

"While foreign demand is expected to increase more rapidly than that of this country, the availability of foreign oil in excess of foreign requirements and need for dollars abroad will tend to increase the flow of oil into the United States.

"The continuance of foreign countries as sources of oil is dependent upon several factors, chief of which are: The control of these countries by elements favorable to the United States, freedom to utilize the seas for shipping, the availability of tankers which require large amounts of steel and manpower for construction, and the availability of materials and manpower to the foreign countries."

The authors of this section should be commended for their closing remarks which are quoted in full below:

"In order to provide an immediately available reserve crude-oil capacity, it is necessary to maintain actively producing fields with ability to produce beyond present requirements. Fields without wells and equipment are useless because of the possibility that materials, men, and time may not be available when most needed. Similarly, maintenance of productive fields with a substantial shut-in capacity is impossible if the huge investment necessary to their development is to be repaid."

CHAPTERS 24 AND 25

Chapter 25 is based entirely on material prepared by the Bureau of Mines. These are the most reliable statistics available and, as they deal with the past rather than project future conditions, they represent a very valuable contribution by the Commission.

Chapter 24, on the other hand, was computed by the Commission's staff, using data compiled from any sources. The Commission discusses the preparation of the tables included in chapter 24 as follows:

"The statistical procedure employed by the Commission's staff in measuring the production of all raw materials was to express the physical-volume output of each raw material in a given year in terms of its average unit dollar value over the 1935–39 period and then to add together for that year all these constant dollar values. A weight base in the period 1947–49 would have been preferable, but the lack of a census of mineral industries since 1939 made it impossible to arrive at reasonably accurate mine values of major minerals for the later period. The Commission's series of raw-materials production for 1900–1950 are thus series of constant-dollar aggregates measuring the annual volume of raw materials output. Although the output of different raw materials such as bales of cotton, barrels of oil, tons of ore, and cubic feet of gas cannot be added together, their values in constant dollars can be added meaningfully."

"As much as possible, the Commission's staff used data compiled by the most authoritative sources. Thus data on mineral production came largely from the Bureau of Mines in the United States Department of the Interior; on agricultural production, from the Bureau of Agricultural Economics, and on forest products, from the Forest Service, in the United States Department of Agriculture; and on fish and wildlife production, from the Fish and Wildlife Service in the United States Department of the Interior. Data for the imports and exports of raw materials were originally compiled by the Bureau of the Census (prior to 1941 by the Bureau of Foreign and Domestic Commerce) in the United States Department of Commerce. For many raw materials, the same agencies that compiled the production data had also developed series summarizing the foreign-trade data, and the Commission's staff used much of this secondary source material."

The quotations above clearly show the possibilities for statistical discrepancies where so many imputations are made.

It is disturbing that these series will be used by serious students throughout the country for many years as the best available data. Undoubtedly conclusions will be drawn from this data which will be unwarranted. There is an unfortunate tendency on the part of many people to accept something as true because it is printed in a book published by the United States Government, and the tables look imposing. The quality of these tables is best indicated by the following quotation, taken from page 173, which happens to discuss the fur series:

"The fur production component is the weakest element of the Commission's raw-materials figures. In the base period (1935–39) furs constituted about 38 percent of the combined fish and wildlife production. The fur output data are based on three benchmark figures for the years 1900, 1925, and 1947. For these years the Fish and Wildlife Service estimated total value of domestic raw or undressed fur production, including furs from wild animals and from animals raised in captivity. The Commission converted these three benchmark values into 1935–39 dollars and interpolated or extrapolated production figures for all the other years of the 1900–1950 period. For 1934 to 1950 these interpolations and extrapolations were based on numbers of wild animals trapped, as reported by the Fish and Wildlife Service. For this purpose, use was made of a sample of 12 wild animals caught in 24 selected States, Alaska, and the Pribilof Islands, for which areas more or less regular reports were available. This sample represented 34 percent of the estimated constant-dollar value of total fur production in 1947. For years prior to 1934, the production was estimated by straight-line interpolation between the benchmarks.

"The quantities for the different types of furs produced were weighted by the 1935–39 average unit values of furs exported, wherever such data were

available, and by 1935–39 average unit import values where export data were not available.

"For the period 1935 to 1950, inclusive, quantity figures for the different types of furs imported and exported were multiplied by their respective 1935–1939 average unit values. For years prior to 1935, the fur import and export quantities were obtained by deflating the corresponding total values by related price indexes. These foreign-trade data represent essentially complete coverage of raw furs, with any errors in measurement due primarily to conversion of values into number of skins."

It should be noted that the Commission published tables assigning values to every year from 1900 to 1950—a span of 50 years—with only 3 benchmark years: namely, 1900, 1925, and 1947. In fact, the data for these years were themselves estimates. Since this series deals with furs, it would seem that general economic conditions would have a great deal to do with the demand for furs, and one may raise questions as to the basis for making the obvious adjustments in such a series to cover a year of prosperity, such as 1928, and a year of depression, such as 1932, when no actual facts are available to serve as a guide for any of these adjustments. One wonders how many of the people using these tables will realize the qualifications which surround them. Since these tables were used to formulate policy in volume I, these qualifications naturally affect every recommendation which was based on the statistical work of the staff.

The series on forest products also gives an impression of accuracy which is probably not warranted by the data. The impression is that the study is so thorough that the only omissions are Christmas trees, maple syrup, and maple sugar, tanbark, holly, mistletoe, ferns, wild nuts, and balsam.

The measurements of consumption given in this chapter are also compounded from a multitude of estimates. The Commission said:

"The physical quantities produced, exported, and imported were multiplied by their average 1935–39 unit values at the mine. For imports or exports of semiprocessed or processed items, the major raw materials contained were estimated. Thus, the mineral equivalents of the foreign-trade statistics for paints, other chemicals, and machinery were computed and added to the figures for the crude minerals. For example, an import of aluminum sulfate was represented by additions to the bauxite and sulfur series. Many of these conversions were made by the Bureau of Mines staff and many others by the Commission staff.

"It was desirable, because of the large quantity involved, to obtain a series for the iron-ore equivalent of machinery-and-vehicles exports and imports. This series was based on 1943–44 data published by the Bureau of the Census showing the gross shipping weight of these items. In order to reduce these gross-weight figures to net weight, excluding the weight of containers, estimates of the ratio of net to gross weight for specific groups of items were obtained from various Government agencies and private manufacturing firms.

"The next step was to obtain a measure of iron-ore equivalent by estimating the iron content of items in the principal machinery-and-vehicles subgroups. This content was based on statistics for iron and steel consumed by each industry, as published in the 1947 Census of Manufacturers volumes, supplemented by unpublished census statistics on value of specific materials consumed in manufacturing plants. Some data on materials contents were also obtained from private firms.

"The 1943–44 figures for iron content of machinery-and-vehicles exports were carried back to earlier years and forward to 1950 in four segments: (1) Exports by vessel were based on an index constructed from data collected by the Chief of Engineers of the United States Army for annual tonnages of types of machinery and vehicles shipped by vessel for the years 1920 through 1949. The 1950 figure was estimated by the Commission's staff. (2) Shipments by rail and truck were derived for 1918-50 by deflating the total value of exports of machinery and vehicles to Canada and Mexico by an index of the average price of machinery and vehicles. (3) Shipments by air and all other means, largely merchant vessels and aircraft exported under their own power, were extrapolated by an index of the total light displacement weight of merchant-vessel exports available for the period 1938–50. This type of export was negligible prior to 1938. (4) Finally, exports for years prior to 1920 were extrapolated by deflating the total value of machinery and vehicles exported by a price index.

"The iron-content of machinery and vehicles exported, as thus estimated, proved to be quite substantial. It amounted to about 5.5 million tons at the peak volume of merchant-vessel exports in 1947. In 1950, it was nearly 2.5 million tons, or about 5 percent of the United States production of iron. The iron-ore equivalent of machinery-and-vehicles imports is negligible in comparison to the exports."

The Commission concludes with this statement:

"The measures of raw materials production and apparent consumption that have been constructed by the staff of the President's Materials Policy Commission enable the analyst of economic trends to appraise the long-term changes in the physical volume of output and consumption of all raw materials in the United States. Previously no such aggregate measures existed, notwithstanding the existence of separate indexes of output in such fields as agriculture, mining, and forestry. Furthermore, these measures provide, for the first time, the means of determining the position of the United States as a net importer or exporter of all raw materials and the significant changes in that position over the last half century."

While the Commission seems quite pleased with its contribution in making these tables available and states that "previously no such aggregate measures existed," one may wonder whether this was a contribution or a great disservice, as figures of this character may well be the basis for policy decisions not at all warranted by the underlying data.

VOLUME III

THE OUTLOOK FOR ENERGY SOURCES

Volume III deals with the Nation's energy sources. The studies contained therein were prepared to assist the Commission's analysis of this important field. Many consultants, whose professional competence is of the highest order, are listed as having provided data and suggestions for these studies. The report points out, however, that they "did not necessarily support the conclusions of the Commission." It is quite apparent that many of the conclusions and recommendations of the Commission could not be supported by some of these authorities.

The Commission states that the estimates of future demand shown in volume III follow the same projections and assumptions developed in volume II. They are therefore subject to all of the qualifications which have already been outlined in discussing volume II.

The Commission says:

"The essence of the energy problem—the total energy problem which in this volume is dissected in individual studies—is that huge further expansion of supply must be accomplished in the face of limitations upon the free world resource base which threaten to force real costs upward and which might, in event of war, cause serious shortages."

The Commission raises the following questions which the studies of volume III attempt to answer:

"Does the United States have the natural resources—the petroleum and gas, the coal, the waterpower—to provide enough energy for the future?

"Will the real cost of energy be forced upward, and will any resultant rise retard economic growth?

"In the event of all-out war at any time in the next 25 years, will the United States and its allies have enough fuels and other forms of energy to support full economic mobilization and maximum fighting strength?

"What opportunities are there for strengthening the long-term energy position of the United States and other free nations, and what will it take to develop these opportunities?"

THE OUTLOOK FOR ENERGY SOURCES

CHAPTER I. OIL

The Commission discusses the supply-and-demand relations for petroleum products as follows:

"The free world's demand for oil products can be expected to continue to grow vigorously over the next quarter century. Consumption may be expected to double in the United States, triple in Europe, and possibly quadruple elsewhere. Free world oil demand, about 10 million barrels daily in 1950, may accordingly approach 27 million barrels in 1975.

"The free world's liquid fuel resources can support this tremendous increase in demand. The geological basis for greatly increased crude petroleum production is clearly visible in the Middle East, and prospects in Venezuela, Canada, and elsewhere in the Western Hemisphere are favorable. In the United States, however, the outlook is somewhat uncertain. This country is presently producing about half the world's oil on the basis of less than 30 percent of the world's proved reserves and of probably a considerably smaller fraction of the world's undiscovered deposits."

The Commission's studies show that:

"Oil is still being discovered in this country more rapidly than it is being produced. The prevailing view in the petroleum industry is that there is no lack of places in which the search for oil may be successful, so that greater knowledge, improved technology, and increased exploratory work give promise of large supplies for the foreseeable future."

This statement clearly shows that the United States is not a have-not Nation in petroleum. Notwithstanding the above statement the Commission says:

"Ultimately the growth in United States crude production will have to taper off as it becomes increasingly difficult to make new discoveries. In any case, production prospects are better abroad, so that it will be economical for the United States to turn to imports to meet an increasing proportion of its growing demand for oil."

This statement is completely unsupported and again represents an expression of the Commission's bias toward the importation of raw materials wherever possible.

Immediately following the preceding statements, the Commission shows how essential it is that we maintain an industry in being in the United States because of the overriding security consideration. The Commission says:

"The gravest problem is the threat to the wartime security of the free world implicit in the pattern of world oil supply that is taking shape. The Eastern Hemisphere, and Europe in particular, is coming to depend on huge imports of oil from the Middle East, which must be considered more vulnerable to attack by a potential enemy than are Western Hemisphere sources.

"Oil is even more urgently needed in war than in peace, and sources of supply and transportation routes may be vulnerable to enemy attack. There is accordingly required a continuously operative joint Government-industry program of preparedness to meet a wartime emergency. A balanced reserve capacity to produce oil in the Western Hemisphere, and to transport and refine it, must be kept in being along with an ability to expand this capacity further in wartime as required.

"In the near future an emergency cushion can be maintained as part of the normal structure of the industry, but additional arrangements are necessary to preserve the basis of wartime expansion for the more distant future. As free world dependence on vulnerable sources grows, emergency expansibility of production in secure areas must also grow."

If under wartime conditions Europe were to become dependent upon the Western Hemisphere's petroleum resources, the necessity for maintaining and developing our own resources becomes of paramount consideration. The Commission recognizes this and suggests the development of more adequate proved

reserves in the United States. This can only be accomplished by a more favorable attitude by the Government toward our domestic oil producers.

This chapter recommends financial assistance for private companies in the commercial production of shale oil or of oil from coal.

The discussion of volume I has already shown that such action is not necessary and that market forces will insure the development of these resources when they are needed.

Page 3 of the study reviews the pattern of use of petroleum products as follows:

"Oil products used for stationary heat and power furnish energy in close competition with other fuels, while in transportation and in special uses, other fuels are not closely competitive. The principal concern for future oil supplies therefore centers upon transportation fuel and special products. An inadequate supply of liquid fuel to meet transportation demands would raise very serious problems, since a shift to nonliquid fuels for transportation would be difficult and expensive.

"Fortunately such a shift need never be required. Should domestic supplies of crude petroleum become inadequate and foreign crude supplies unavailable, the problem could be met over the long run not only through recourse to synthetics from oil shale and coal, as described later herein, but also in part from a shift in the pattern of use. Coal, for example, could be used in many stationary heat and power applications, and more distillate could be used as Diesel fuel. A whole series of readjustments would take place, the net effect of which would be to permit an increased proportion of oil products to go to uses where the liquid form has special advantages. Meanwhile synthetic liquid products from oil shale and coal might find substitution possibilities over a broad range of uses, both stationary and in transportation."

This again shows that market forces, if allowed to operate, will make the necessary readjustment. It is significant that the Commission recognizes that the petroleum industry operating under free enterprise has made a phenomenal contribution to our economy. It said:

"Prices of petroleum products, measured in dollars of constant purchasing power, were more than 16 percent lower in 1950 than in 1925, in spite of a 24-percent rise in the price of crude oil in constant dollars."

The Commission itself in these studies disposes of the argument that we are failing to maintain adequate reserves in the United States. It said:

"There is as yet no evidence of failure to discover reserves adequate to support growing production."

Probably the most serious problem of the United States lies in the vulnerability of Middle East oil and the hazards to tanker operations under wartime conditions. These studies show:

"In view of the wartime essentiality of oil, and the hazards to the Middle East in particular and to world oil supplies and transport in general, the future pattern poses a serious problem of free world security and offers a strong challenge to public policy to encourage the growth of production capacity in the United States and the rest of the Western Hemisphere.

"The United States cannot take undue comfort from the prospect that the Western Hemisphere will perhaps remain self-sufficient in oil for a long time. Its friends and allies in the Eastern Hemisphere will become increasingly dependent on the Middle East, but if supplies from that area should be substantially reduced in time of war, those allies would then have to be supplied from the remaining sources, largely in this hemisphere. The pattern of wartime supply and consumption for which preparation must be made is, therefore, a single comprehensive pattern for the entire free world.

"The initial bottleneck in wartime supply would almost certainly be tankers. The convoying of tankers and wartime conditions of port operation would increase turnaround time and so reduce the overall capacity of the tanker fleet. Tankers would be sunk. Military demands for oil would require deliveries to ports not well equipped for unloading of tankers and storing oil, so that tankers would come to be used as floating storage facilities. All in all it can be expected that, in the absence of the loss of a major producing area, such as the Middle East, tanker availabilities would initially govern wartime supply. If major producing areas (in particular the Middle East) were denied to the free world, tankers from those runs would presumably be available to transport increased production from Western Hemisphere sources.

"After tankers, the next most critical facilities would be refineries. Far more vulnerable than oil fields or even tankers, they offer a tempting target for aerial

bombardment and possibly for sabotage. A modern refinery takes from 18 months to 2 years to build under normal conditions, and some of the specialized capacity for products needed in modern warfare takes even longer. Given high priorities for steel, manpower, and components, refineries can be constructed considerably more rapidly, but at the expense of other parts of the war effort.

"Finally, there is required the ability to achieve an extraordinary increase of crude-oil production in secure areas, balanced with corresponding refining and transportation facilities first discussed.

"The emergency oil production and transportation cushion must be planned for in terms of two time phases: that cushion of 'standby capacity' which would be immediately available if war should break out, and the additional increases of capacity and output that could be provided with satisfactory speed after war had started."

The Commission studies show the necessity of encouraging exploration within the United States. It said:

"The prospects for future production of crude oil in the United States depend primarily on the rate of exploration and its success. In the past the rate of exploration has been responsive to market conditions. Furthermore, discoveries have largely been proportional to the rate of exploration with such year-to-year variability as is to be expected from the uncertainties inherent in wildcatting.

"The principal influence of public policy to date upon the rate of exploration for crude oil, beyond the provision of the general legal and social framework in which the free enterprise of the wildcatter can flourish, is to be found in the tax system. In particular, the provisions permitting the expensing of the intangible costs of drilling and the charging of depletion as a percentage of the value of oil produced and sold have acted as powerful stimulants to exploration. If these provisions were removed, wildcatting activities would be sharply reduced with two possible results. Either domestic petroleum prices would eventually rise in response to reduced production, tending to restore the incentive to exploration, or more probably under present circumstances, imports would increase.

"These tax provisions are discussed in volume I as they apply to the entire minerals industry. The conclusions there reached are in particular applicable to petroleum. It was there recommended that percentage depletion be retained because of its strong inducement to risk capital to enter the minerals industries fields but that the rates now provided in the Internal Revenue Code be raised no further. It was also suggested that there is one notable exception to this conclusion—exploration and development costs for minerals should be fully expensible for tax purposes because of the direct incentive this arrangement gives for capital to take risks in highly uncertain fields. Such expensing would be likely to be particularly important for the petroleum industry whose annual exploration and development costs are measured in billions of dollars."

This study on oil discusses the possibility of conserving the use of oil. The Commission says:

"There are likewise large opportunities for conservation in use of oil, especially in the design of passenger automobiles and in their operation. There is no doubt that the estimated 680 billion passenger-miles of automobile travel in the United States in 1950 could have been achieved at a lower expenditure of gasoline than the 24 billion gallons actually used. If, for example, passengers rode 3 or 4 to a car in cars averaging 25 to 30 miles to the gallon, only 7 to 9 billion gallons would have been required.

"The American public is willing to pay added costs for the comfort of large cars and for the pleasure of what is popularly referred to as automobile 'performance'—power to accelerate rapidly, to maintain high speeds, and to climb hills in high gear."

Under wartime conditions, the American public has encouraged the use of share-the-ride pools and has endeavored to see that most cars had more than one passenger. Under normal conditions the American standard-of-living has been based on freedom of choice and a large part of the dynamic drive of the American economy results from the individual desires of Americans to go when and where they want and to travel alone if they so desire. There is no question that we could conserve fuel if we substituted buses for all private cars and if we regimented our people. The Commission has not shown any necessity for such drastic changes in the American standard of living. The American people's willingness to purchase new cars in order to obtain better performance has provided much of the present employment in the durable-goods industries and has contributed to the prosperity of this country.

The Commission continues with its views an automobile design as follows:

"The additional possibilities of improving mileage per gallon without using smaller cars or less powerful engines are rather limited, in spite of the dramatic fact that the automobile utilizes only 6 percent of the energy put into the gas tank. The theoretical efficiency of an automobile engine at full load is about 25 percent. The average fuel-utilization efficiency of the American motorcar is so low relative to the best attainable largely because its operates most of the time under a low load. The average automobile is probably capable of carrying 5 or 6 persons at steady high speeds, yet it is estimated that in 1950 the driver rode alone in more than half of the private-car trips while in less than a fifth of the trips did he have 2 or more passengers with him."

The Commission is apparently unaware of the fact that one of the reasons for the higher-powered engines which have characterized postwar automobiles was the fact that such engines were far more efficient and in addition to giving better performance, also were more economical. Thus, despite the Commission's preconceived ideas on automobile design, the American people have enjoyed improved performance and better economy at one and the same time. Despite the Commission's remarks, it is doubtful that the average American motorist is ready to have a Government commissar decide how many passengers can accompany him on each trip.

The Commission continues its discussion of automobile design. It says:

"There are three principal methods of improving the efficiency of the automobile by change of design without sacrificing comfort or performance; increasing the compression ratio, supercharging, and use of an overdrive or an automatic transmission designed for maximum efficiency. The efficiency gained from an increased compression ratio is, however, at least in part, illusory because a great deal of energy is lost at the refinery in making the high-octane gasoline that must be used. Supercharging designed to increase economy presents difficult engineering problems. The biggest scope for improvement, therefore, probably lies in greater use of the overdrive or of an automatic transmission. It has been estimated that a combination of high compression ratio and fully automatic transmission or suitable overdrive might double automotive efficiency from the usual 15 or 20 miles per gallon to 30 or 40, without any loss in performance characteristics."

The automobile industry, which is a highly competitive industry, has developed automatic transmissions and higher-compression engines, and is continuing to spend hundreds of millions of dollars to improve its product. No Government commission is necessary to assist the automotive industry and the oil industry in together giving the American public the best possible value in transportation.

The Commission makes the following observation:

"The average utilization efficiency with allowance for the greater work done in moving a given distance at high speed, can also be increased by giving the private automobile the kind of highways and streets on which it can operate at its maximum efficiency. That means the construction of city express highways along which cars could run at 40 or 50 miles an hour with a minimum of stops and cross-country highways on which even higher speeds can be safely maintained. Much greater gains are likely to be achieved in the United States from further development and improvement of the street and highway system than from fuel economies derived from improved designs of cars and engines."

There is no question that the construction of improved city expressways and turnpikes for cross-country driving is one of the most important requirements of our country today.

The Commission ends this study on oil by reviewing imports and tariffs as follows:

"The energy economy of the United States has prospered on the basis of using the cheapest available fuels and can prosper most in the future if our import policy continues to permit oil consumers to have access to the lowest-cost sources consistent with security. Geological and economic conditions throughout the world favor an increasing reliance on imports to meet a considerable part of the future growth of United States consumption, even though United States production of oil can also be expected to continue to grow. Consumption is expected to increase more rapidly than production, so as to leave room both for increasing imports and a healthy domestic petroleum industry.

"The present excise tax on imports of crude oil and fuel oil stands at 21 cents a barrel for all imports over a quota, which in each year is equal to 5 percent of

the previous year's run of crude to refineries in the United States. Other refined products are taxed at a comparable level, except for gasoline and lubricating oils, which are taxed at prohibitive levels.

"It is clearly to the interest of the United States and the rest of the free world to develop the oil-production capacity of the Western Hemisphere. In view of this fact and of the general desirability of reducing trade barriers throughout the free world, the tariff on crude oil should eventually be abolished.

"In the short run, however, the problem involves many complicated questions affecting broader foreign diplomatic, economic, and trade policies. Within that larger framework considerations other than those that are the special concern of this Commission must largely govern the tariff policy. Nonetheless, heavy weight should at all times be given to the importance of demonstrating, clearly and consistently, to oil-exporting nations our basic long-run policy of encouraging foreign-oil development and imports to the United States, to the fullest extent consistent with security."

Once again the Commission cannot resist its bias to urge the importation of foreign products, regardless of what the consequence may be, not only to the oil industry but to the railroads and the coal industry who are in competition with residual fuels.

CHAPTER 2. NATURAL GAS

The natural gas industry has shown a dramatic increase since the early 1920's. More than five times as much gas was marketed in 1950 as in 1925, and the increase in consumption in 1951 was the largest up to that date. The growth of natural gas had been based on new discoveries resulting from the extensive search for oil. The Commission states:

"There are four important challenges to our natural gas economy: (*a*) To stimulate maximum economic discovery of natural gas resources. (*b*) To avoid waste in the production of natural gas and to insure that full advantage is taken of the driving force of natural gas in lifting oil in order to get maximum economic recovery of the oil and gas. (*c*) To improve the pattern of use so that relatively more gas goes to those uses in which it has a special advantage, and relatively less to those that could be served just as well by other fuels. (*d*) To lay the basis for an orderly transition to other fuels at that distant but inevitable date when natural gas production falls off."

Natural gas is a regulated industry. The Commission says:

"Natural gas is subject to greater regulation than its principal competitors, coal and fuel oil. Its distribution is regulated by State public utility commissions in a manner similar to the regulation of electric power, its interstate transportation by the Federal Power Commission somewhat after the same pattern, and its production by the State authorities who regulate petroleum production. Many problems arise from the different aims and methods of these regulatory agencies, as well as from the fact that regulated natural gas competes with unregulated fuels."

The most important decision confronting us is whether market forces rather than regulatory agencies can be depended upon to channel natural gas to those uses where it has a special advantage. The Commission says:

"As distribution, processing, storage, gathering, and transportation facilities are developed, market forces can be expected to bring a steady improvement in directing gas to those uses and those markets that can be served by natural gas to the greatest economic advantage. The natural gas industry should have ample incentive to improve the pattern of use in this manner, since the special advantage uses can afford to pay a higher price. State and Federal policy must join with private enterprise in encouraging a rapid adjustment of the production and consumption patterns of natural gas."

The nature of the problem is indicated by examining the price relationships existing in 1950. The Commission says:

"* * * The general price relationships may, however, be illustrated by some of the operations of one transportation and distribution system in 1950. Gas was purchased at the field in Texas and Louisiana at an average price close to 5 cents per thousand cubic feet, and was sold to main-line industrial customers or to gas distributing utilities in Ohio, about a thousand miles from the source of supply, for about 19 to 21 cents per thousand cubic feet. The utilities resold the gas to their industrial customers at the average price of 42 cents and to residential customers at the average price of 54 cents. At these average prices the main-line Ohio customers were getting gas at considerably less than half the cost of equivalent energy in the form of heavy fuel oil. The industrial customers of the utilities were buying energy about 30 percent cheaper than if they had bought residual fuel oil at tank wagon prices, and the residential consumers about 40 percent cheaper than if they had bought furnace oil. Of course, a new pipeline company buying all its gas at new contract prices of 10 or 11 cents per thousand cubic feet would presumably have to charge correspondingly higher prices, though still well below the prices of competitive fuels within a thousand-mile radius.

"The potential demand for natural gas at or near present prices to consumers far exceeds the amount currently being marketed. The construction of additional facilities for transportation and distribution will help meet some of the unsatisfied potential demand, but the excess demand will eventually have to be

squeezed out either by company or governmental allocation or by such increases of price at points of consumption as will make the energy costs of natural gas comparable in competing uses with the cost of other fuels, with allowance for differences in convenience of use."

The Commission has attempted to estimate the potential reserves of natural gas, but it is quite apparent that no reliable estimates can be made at this time. The Commission says:

"The same uncertainties that cloud the long-run future of petroleum supply from domestic sources in the United States also affect estimates of future supplies of natural gas. Proved economically recoverable reserves of natural gas at the end of 1950 were 186 trillion cubic feet, or about 26 times the 1950 net production of 7.1 trillion cubic feet.

"Few estimates have ever been attempted of the total amount of 'economically recoverable' natural gas that can be expected to be discovered in the future. The only well-known projection so far published indicates that 510 trillion cubic feet, including reserves already proved, may remain to be produced in the future.

"This estimate is closely linked to the estimate of ultimate potential petroleum reserves discussed in the chapter on oil. Both estimates are highly speculative. The prospects for future gas production, like those for oil, can more safely be evaluated on the basis of the relation of rates of discovery to rates of production than on estimates of ultimate potential. Natural gas discovery rates have been highly satisfactory relative to production over the recent past. New reserves proved from 1945 to 1951 have been more than twice as large as net production over the same period. When new discoveries and developments run closer to annual production it may be taken as warning of an imminent slowdown of production."

The Commission shows conclusively that the future of natural gas is closely linked to that of oil. If domestic demand for crude falls off, the return of gas to the ground may be discouraged and thus lead to a more rapid depletion of proved petroleum reserves, as indicated in the quotation which follows from the Commission's report:

"If Middle Eastern oil competes in the United States market and if shale-oil production should become economic, there will be a ceiling on the possible price rise of crude oil. Under these circumstances, a rise of natural-gas prices might be almost as powerful an increased stimulus to oil exploration as any prospective price rise of crude oil. It would also stimulate gas exploration in its own right. In addition to this tendency to encourage discovery of more oil and gas, a higher price for natural gas would probably induce some reduction in the field losses and waste that now absorb over 10 percent of the net production of natural gas. The higher price would stimulate investment in gathering and handling equipment that it would not pay to install at lower gas prices. It might, however, discourage those practices that involve return of gas to the ground, and would probably also lead to a more rapid depletion of proved reserves."

The problems of natural gas are largely those involving the channeling of this important fuel to those uses where its special properties have the greatest advantage. The Commission wisely states that it believes market forces can accomplish this result. It says:

"It is sometimes argued that end-use control is necessary to prevent gas from being used now for low value general uses, in order that it may be saved for higher value special advantage uses later. The desirability of eliminating low value general uses (such as for boiler fuel at points distant from the fields) as rapidly as possible is universally recognized. There is, however, some controversy over whether this should be achieved by a prohibition of low-grade uses, or by positive measures to encourage such a development of the gas industry that it no longer pays to use gas for low-grade uses.

"The development of underground storage near markets is already leading to the discontinuation of the off-season sale of natural gas for boiler fuel to electric generating utilities in the East. For example, natural gas from the Texas-Louisiana area can be put into underground storage in abandoned Pennsylvania gas fields, or similar geological structures, in the summer, rather than being sold for boiler fuel; the stored gas can then be sold for high-grade winter uses such as house heating. In this way also, a given sized pipeline (from field to storage areas) can serve a larger number of special advantage customers. Further development of such storage can greatly contribute to the reduction of

off-season consumption in low-grade uses and so support a greater flow to seasonal special advantage uses.

"During the period of rapid extension of pipelines, sales of natural gas for low-grade uses help to absorb the cost of developing and carrying the high-grade markets. As those markets are developed the gas industry will find it worth while to shift its supplies to them. The argument for direct end-use control must be tempered by consideration of the difficulties in the way of a rapid development of facilities to extend the market to high-grade uses, and the contribution of industrial sales in carrying part of the costs of such development. There appears to be no economic basis for designing curbs on low-grade uses that would be more valid and more suitable than market forces in guiding the gas to the highest grade use."

The Federal Power Commission does have the responsibility, when authorizing the construction of pipelines, to make sure that adequate reserves are available. This problem is presented by the Commission as follows:

"Meanwhile, in guiding the rapid development of the natural-gas industry, it is important for regulatory authorities to bear in mind the ultimate exhaustion of natural-gas supplies, with the aim of avoiding costly overexpansion. The Federal Power Commission has customarily required, as a condition for authorizing construction of a pipeline, that a certain number of years' supplies be reserved for the particular pipeline, usually 20 years, although shorter periods have sometimes been countenanced. As the natural-gas industry matures, an even longer horizon may be appropriate.

"It will become increasingly important for the Federal Power Commission, in considering 'dedicated reserves' for a proposed pipeline, to take into account the eventual impact of new dedications upon the useful life of existing pipelines, upon the consumers they serve, and upon the long-range supply position of communities in the producing area. Excessive building of pipelines and overcommitment of limited reserves could lead, when reserves are gone, to premature obsolescence of costly capital equipment, for operators and consumers alike. The owners of the pipelines and those who extend them credit can generally be expected effectively to safeguard continued supplies for their transportation and distributing systems. However, the regulatory authorities must also have a strong responsibility in this direction."

CHAPTER 3. COAL

The Commission shows that:

"The coal reserves of the United States are estimated at 2,500 billion short tons, of which about half may be deemed recoverable with present techniques. The recoverable reserves contain more than 80 percent of the energy of all recoverable mineral fuel reserves. United States coal reserves are about 40 percent of the world total—as much as those of the Union of Soviet Socialist Republics and China combined.

"About 30 percent of United States coal is in the Appalachian and interior regions; the rest is west of the Mississippi. Virtually all eastern coal is bituminous. Seventy-five percent of western coal consists of subbituminous coal and lignite, and most of the bituminous coal also is not suitable for coking. Only 1 percent of United States coal reserves is anthracite—nearly all in Pennsylvania."

There can be no doubt that ultimately coal will be the most important energy resource of the United States. For the past few decades, however, coal has been declining in relative importance, and this trend will doubtless continue for some years into the future. The Commission shows that:

"Despite a rapid increase in energy demand in the United States in the last 25 years, coal's share of the market has steadily declined. Both less convenient use and—with bulkier handling in transportation—higher prices have caused coal to lose out in many market places to oil and gas. Some markets, however, are expanding, and this trend—particularly greater consumption to produce electricity—is likely to continue. While coal's percentage share of the 1975 energy total is likely to be still less than now, actual volume of coal at that date may be 60 percent above the present levels. Sometime after that date—whenever the cost relationship shifts and domestic oil and gas production become either too high in cost or too low in volume—coal is expected gradually to take over the heavier part of the energy burden in the United States. Reserves are more than ample.

"The extent and the timing of coal's upward turn will depend importantly on technological developments: better mining and processing methods, cheaper transportation methods, more efficient utilization. Advances in manufacture of gas or liquid fuels from coal, as well as chemicals, could increase consumption."

"Coal, which supplied two-thirds of the total energy consumed in the mid-twenties, dropped to slightly more than 40 percent in 1950. In round figures, consumption of bituminous coal and anthracite dropped from about 600 million short tons a year in the twenties to around 500 million now. In 1950 demands on United States coal production amounted to 522 million tons, including 493 millions tons consumed domestically and exports of 29 million tons."

Coal exports have become important since the war, as Japan's traditional sources are now chiefly within Soviet territory. Canada has been importing increasing amounts of coal, and Western Europe has also imported substantial quantities of coal from the United States.

Coal has lost out in the competitive race during recent years due to higher relative costs and the difficulties of handling coal compared with liquid fuels and natural gas. The Commission discusses the cost outlook at follows:

"Despite the increase in output per man-hour, the price of producing bituminous coal since the prewar period has increased more rapidly than the price level in general. The average value per ton of bituminous coal f. o. b. mine stood in 1950 at 262 percent of the 1935–39 average ($4.85 as compared with $1.85), while the wholesale price index averaged 200 and the general price level averaged 183.

"This increase can be attributed largely to the fact that coal miners' average hourly earings (in dollars for constant purchasing power), including adjustment for portal-to-portal pay and employers' contribution to the miners' welfare-and-retirement fund, increased more rapidly than output per man-hour, with a consequent rise in labor costs per unit output. This placed coal at a price disadvantage relative to gas or oil in many areas: the average wholesale price

of bituminous coal doubled between 1935–39 and 1950, while the average delivered price of natural gas for industrial use remained practically unchanged. The wholesale price of fuel oil increased in rough parallel with coal, but since handling charges are greater for coal than for other fuels, coal was placed at an even greater disadvantage in the retail market. Between 1935–39 and 1950 the average price of bituminous coal to the domestic consumer has more than doubled, while the price of fuel oil increased only 87 percent and the price of gas remained practically unchanged. The average price of anthracite increased 91 percent during the same period. In many parts of the country natural gas and fuel oil sold at lower costs to the consumer than coal of equivalent heating value. Fuel oil has been underselling coal of equivalent heating value at New York Harbor in 10 out of 19 nonwar years since 1928. The competitive position of coal would have been even worse if railroad freight rates had increased in proportion with the general price level, but they have risen only about 50 percent since 1935–39."

Efforts have been made to increase productivity in producing coal, and these efforts have been noteworthy. In fact, American productivity is outstanding when compared with foreign producers. The Commission shows:

"United States production of 556 million short tons of bituminous and anthracite coals in 1950 represented more than one-quarter of world production and was 100 million tons greater than that of the entire Soviet bloc.

"The United States is also foremost in coal productivity per man-day. In 1949, underground coal miners in the United States produced an average of 6.7 tons per day—more than 3 times the average daily output of the Polish miner; 4 times the British and German; 5 to 6 times the French, Belgian, and Russian; 10 times the Japanese. Since foreign miners work longer hours, the United States advantage is even greater in terms of output per man-hour. Also, productivity in United States mines has been rising more rapidly than in other countries. During the past 25 years, United States output per man-hour rose by 72 percent, from 0.5 tons in the midtwenties to 0.86 tons in 1950, a rise partly attributable to the increase of open-pit or strip mining.

"This increased productivity in the United States has offset the gradual exodus of labor from the coal mines—a trend that has created such serious problems in Europe. In the midtwenties, nearly 600,000 miners were necessary to produce some 600 million tons of bituminous coal in the United States; in 1947, the most recent year of full utilization of coal production capacity, some 420,000 miners produced more than 630 million tons.

"These remarkable achievements were assisted by favorable geological conditions as well as by continuous improvements in mining methods. Indeed geological conditions are largely responsible, both for the higher absolute level of productivity in the United States and for the more rapid increase of productivity over that of Europe.

"The greater thickness of the seams in the United States, the smaller overburden (the average depth of European mines is greater than the maximum depth of American mines), the prevalence of horizontal seams in which locomotive haulage can be used effectively, the relative absence of faulting—all these have been favorable to rapid mechanization. The abundance of economically minable coal beds has permitted the use of the labor-saving (though coal-wasting) room-and-pillar system of mining. These factors will continue to favor an increasing level of productivity in the United States.

"Two other geological factors, favorable in the past, will not hold good much longer. The fact that beds minable through drift or slope entries are becoming scarce and that vertical shafts often will have to be used, especially in the Appalachian fields, will tend to increase costs. Of even greater importance, deposits that are economically minable by strip methods are limited.

"Strip mining for coal is relatively recent and became practical only when large power shovels, excavators, and bulldozers became available to remove heavy overburden. Its output per man is about three times as high as in underground mining, and 95 percent of the coal can be recovered as compared with some 50 percent underground.

"Strip mining increased rapidly during the war and now accounts for 25 percent of domestic production. Substantial reserves suitable for stripping exist in Ohio, Indiana, Illinois, and farther west, but further expansion is likely to require removing a thicker overburden. Increasing overburden seems to have been the reason that no increase in man-hour productivity has occurred in strip mining since 1930. If, as is likely, strip mining continues to supply only about the

present percentage of production, it will cease to push upward the average of total productivity, and further progress will depend on improvements in underground mining.

"Productivity per man-day of underground bituminous mines has increased by 28 percent since the midtwenties—from 4.5 tons to 5.75 tons in 1950—despite a considerably shortened workday. Productivity per man-hour actually increased by 53 percent, substantially all due to mechanization. Power cutters and drilling machines replace the pick and hand-operated drill of yesterday; mechanical loaders do the work of the hand shovel. New explosives replace the old blasting powder with far greater efficiency and safety. Hand-cutting of bituminous coal in underground mines has dropped in 25 years from 16 percent to less than 2 percent. In the midtwenties only about 1 percent of bituminous coal was loaded mechanically in underground mines; today 70 percent is. Timbering machines and roof bolting devices have made their appearance, and the transport of coal in the mines is speeded by electric engines, larger cars, and belt conveyors.

"The last few years have seen the advent of 'continuous mining' which uses a single molelike machine to combine all operations formerly performed individually and separately, at the face into a synchronized operation.

"Considerable progress has been made in mechanical processing—cleaning, washing, and sizing—which has improved the quality of the coal and adapted it to particular consumer needs. In 1950, 39 percent of bituminous coal produced was mechanically cleaned as against less than 5 percent a quarter century ago. Mechanical cleaning is increasingly necessary as mechanization increases the proportion of impurities and finer sizes."

A special problem exists in connection with coking coal. The United States has been consuming its high-grade coking coals at a rapid rate. The Commission says:

"While the total coal supply has always been adequate, except during work stoppages, this has not been true of coke. Total United States reserves of good quality coking coals are estimated at about 50 billion tons, 80 percent in West Virginia, Pennsylvania, and Maryland. They are being depleted more rapidly than other types of coal, since they account for about 15 to 20 percent of production although only 2 percent of total reserves. Much of the better grades have been mined, and the iron and steel industry has been adjusting to lower grades.

"The real problem has not been in the supply of coal suitable for coking, but in coke-making capacity.

"Coke for steel manufacture is produced by integrated steel companies and their affiliates, by merchant and gas utility plants, and by beehive coke ovens. Historically, the steel industry has constructed coke-making facilities to operate its furnaces at 75 percent capacity and has depended upon others for the rest. When the steel industry operates at full capacity, all three coke-making sources are utilized, beehive ovens being called on last."

The steel industry will doubtless develop satisfactory coke from lower-grade coals as this becomes necessary.

For the long-term future, coal is the Nation's No. 1 fuel. The Commission says:

"This Nation's abundant reserves of coal make coal a major long-range source of fuel and raw materials for a wide variety of industries. Sooner or later several major United States industries will have to sink their tap roots deeply into our coal reserves, as did the railroads earlier. Steel has long been routed to coal and will need increasing amounts. The electric power industry too has been a major customer but now shows signs of becoming a far larger one and a major collaborator toward putting coal more abundantly into use in a variety of ways. Likewise the fast-growing chemicals industry, long tied indirectly to coal through the route of coke and the steel industry holds promise of becoming a much greater user along with the oil industry, which when need and technology are ripe, can turn to coal conversion to secure an important portion of the Nation's liquid fuel supply. Nor is it inconceivable that the natural gas industry may some day turn heavily to coal as a source of product to fill its pipelines."

"Synthetic oil production from coal, if it became economical might push demand even higher. A major war could sharply increase dependence on coal because energy requirements would rise while supplies of other fuels—particularly of imported petroleum—might be reduced. During the Second World War, the demand for coal rose more than 35 percent, from about 480 million tons in 1940 to 650 million tons in 1943 and 1944. A similar or greater increase would have to be anticipated in a future full-scale war.

"Coal currently requires much more labor in its production, transportation, and use than its principal competitors, petroleum and natural gas. It is easier to raise liquids and gases from the ground, to handle them mechanically, and to control them automatically than to perform similar operations for coal. On the other hand, exploration for oil and natural gas adds a considerable expense burden, whereas immense reserves of coal are already known.

"The decline of coal relative to oil and gas can, accordingly, be arrested by one or both of two developments: (a) A fall in coal costs through new ways to produce and handle coal with greater economy of labor, (b) a rise in the cost of competitive fuels relative to coal. Both developments are expected to happen. The time cannot be forecast, but sometime later than 1975 the share of coal in the total supply of energy can be expected to increase markedly. Gas, liquid fuels, and electricity can be produced from coal. The United States has enough coal to meet its energy requirements for a long time to come. When the prices of other fuels begin to rise significantly in relation to coal and most economical hydroelectric power sites have been developed, the demand for coal will go up substantially."

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CHAPTER 4. ELECTRIC ENERGY

The Commission reviews the necessity of developing more electric energy capacity. Electrical energy capacity naturally means the capacity to produce aluminum and other materials which can only be produced successfully through electrolytic processes. This chapter stresses the need for the development of additional waterpower sites. It talks of cooperation between the Federal Government and the private utilities, but it makes no specific suggestions which would bring about a better relationship between these groups. Responsibility rests largely with the Government to foster such cooperation. For example, on page 31 the Commission says:

"The requirements of a successful program of electricity expansion are threefold:

"First, every opportunity must be taken to harness undeveloped waterpower potential at a rapid pace, wherever economically feasible. Since much of this development will have to be at Federal multipurpose sites, Government surveys, planning, and authorization and appropriation procedures should be markedly hastened."

The Eisenhower administration has already shown that some of the so-called Federal multipurpose sites can be developed satisfactorily by private industry or through cooperative efforts. The Commission says:

"A sufficient and timely rate of expansion by the private utility industry might be impeded by uncertainty of investors as to future markets and earnings, by financing difficulties, shortages of material and equipment and the like. In the past, the expansion of Federal hydroelectric facilities—the planning, authorizing and appropriating procedures—has been time-consuming and inadequately geared to the rate of growth of demand. Unless deterrents to private expansion are averted, and unless orderly and more expeditious procedures for public hydro expansion are developed, future growth and security will be hampered."

It will be noted that the above paragraph stresses Federal appropriating procedures and refers obliquely to deterrents to private expansion. This administration has apparently decided to remove the deterrents rather than to concentrate on additional Federal appropriations.

While much stress has been laid on hydroelectric development, the following paragraphs from the Commission's report are noteworthy:

"Hydroelectric production multiplied fourfold from 1925 to 1950, but its contribution to total electricity supply nevertheless fell from nearly one-third to one-quarter in this period. There still remains a considerable undeveloped hydroelectric potential in the United States that could be economically used, but it is physically limited and is clearly inadequate to provide more than a fraction—perhaps one-quarter, at best—of the expanded supply of electricity needed between now and 1975. The bulk of expansion will have to be provided by thermal (fuel-fired) generation.

"Thermal generation actually carried the largest part of the growth from 1925 to 1950, with an almost fourfold increase in supply and with its contribution to total electricity supply expanding from just over two-thirds in 1925 to about three-fourths in 1950. During this period oil and natural gas expanded dramatically as major fuel sources for electric generation; the contribution of oil for this purpose rose to 10 times and gas to 18 times. Coal's contribution, on the other hand, increased to less than fourfold; whereas coal supported nearly nine-tenths of thermal generation in 1925, it accounted for only two-thirds by 1950."

The Commission believes that a further expansion of our electrical energy supply can only be accomplished with some increase in real costs. Yet the Commission shows that great progress has been made in reducing real costs of thermal generation and further progress may be expected in the future. The following paragraphs are noteworthy:

"Data published annually by the Federal Power Commission during the subsequent years 1947 to 1951, inclusive, bear out these general conclusions. De-

spite higher construction costs, higher operating labor and fuel costs the total costs have been further reduced in many instances. This is attributed to betterment of thermal efficiencies with larger units operated at higher pressures and temperatures and reduction of investment costs through elimination of part or all of the relatively expensive station building. Continuous operation at high capacity factors has also been an important factor in the relatively low kilowatt-hour costs of these new postwar plants.

"Fuel costs constitute about 75 percent of 'production costs' and 50 percent of total costs, including capital allowances but excluding taxes of thermal stations. Consequently, improved thermal efficiency represents a major approach to reducing costs. Around 1900, somewhat more than 7 pounds of coal were required to generate 1 kilowatt-hour of energy; by 1925, only 2 pounds were required, and by 1950 only 1.9 pounds. Further improvements cannot be expected at the same rate, but a one-third reduction by 1975 below the 1950 figure seems possible, as against the 40-percent decline in the preceding quarter century, and the 70-percent decline between 1900 and 1925. * * *

"The great contribution of electricity to the economic growth of the United States to date has resulted not only from the tremendous expansion of supply and use, but also from the decline in real costs and real prices of electricity. Between 1925 and 1950 the average price paid for electric power by industrial and commercial customers, adjusted for changes in the purchasing power of the dollar, dropped 58 percent, and by residential users 70 percent. The declining real costs of electric power reflected in these falling prices to consumers were made possible primarily by steady technical advances in the production, transmission, and distribution of electricity, by the economies inherent in larger volume operations and sales, and by declining fuel costs."

The Commission shows that one of the great opportunities in the future lies in improvements in the efficiency of transmission and interconnections between regions and areas. It says:

"Additional opportunities to improve both hydro and thermal electric service to particular areas, and to hold down costs, lie in the further improvement of transmission methods, the fuller integration and coordination of individual electric systems, and cooperative planning of expansion.

"Because electric plants, particularly at hydro sites, are often located at some distance from markets for electric energy, part of the energy generated is lost in transmission. Losses range from 5 to 15 percent, depending upon distance and line loadings. The opportunity exists for using higher voltages—up to 350,000 volts or higher—in order to decrease transmission losses. There are also other possibilities for reducing costs of long-distance power transmission. In the last 10 years' important increases in the capacity of lines have reduced the cost per kilowatt of power transmitteed. It is now economically feasible with a high load factor to carry power from 200 miles up to 600 miles at lower costs than only a few years ago.

"Significant economies in the cost of electric energy have been achieved in the last 30 years by the coordinated operation of thermal and hydroelectric generating plants of utility systems and industrial firms. Early examples of pooling include the Connecticut Valley Power Exchange and the Pennsylvania-New Jersey interconnection. Wide areas of the United States, such as the Pacific Northwest, now have practically complete coordination of electric utility and industrial power generation through interconnections by high-capacity transmission circuits. An outstanding example is the 17-State power pool which extends from the Gulf of Mexico on the south to the Great Lakes on the north. There remain, however, a number of areas where interconnection is incomplete.

"An excellent example of additional opportunities is the proposed California tieline, which would link the major systems in California with the Pacific Northwest power pool. This interconnection would permit the transfer of energy from the Northwest hydroelectric systems to reduce steam-electric generation in California, directly conserving residual fuel oil in that area. It would also substitute for standby generating capacity that would otherwise have to be installed in the Pacific Northwest in order to meet power requirements in periods of low streamflow."

The Commission shows that it will be difficult to increase further the efficiency of hydroelectric generation, as the overall engineering efficiency in the conversion of the energy from falling water to electrical energy delivered at the transmission line is now from 80 to 85 percent.

The Commission discusses the possibilities of further power generation in the Great Lakes drainage area and in the Columbia River Basin. It says:

"Decidedly the most important and attractive hydroelectric sites remaining to be developed in the United States are those located in the Great Lakes drainage area (at Niagara Falls and on the St. Lawrence) and in the Pacific Northwest (the Columbia River Basin.)

"The principal advantage in energy costs enjoyed by the Great Lakes drainage area and, to a much lesser degree, the Pacific Northwest region is the quantity and continuity of the flow of their principal streams. The Great Lakes form a natural storage reservoir unsurpassed anywhere in the world. This reservoir in part does naturally what storage reservoirs elsewhere must be constructed to do, namely, even out the flow of the rivers that drain the region.

"The Columbia River and its tributaries have a large volume of water flowing approximately 1,200 miles from sources in the American and Canadian Rocky Mountains, and dropping as much as 3,000 to 6,000 feet to the ocean. The Columbia runs at flood in summer when the snow on the mountains is melting. Since the snow melts gradually, the river varies less in flow than most other American rivers, but nevertheless still requires a great deal of conservation storage.

"The Federal Power Commission has estimated that the redevelopment of Niagara Falls to use additional stream flow, released for power generation by a United States-Canada treaty in 1950, would provide a net increase of 1,132,000 kilowatts of dependable capacity, and a net increase of 7,884 million kilowatt-hours in average annual energy production to the United States. The costs of energy at the site would be very low and would thus make possible economic transmission of electricity over long distances to New York and New England markets at delivered prices well below rates now prevailing in those markets. Even though modern new steam plants could generate power much more cheaply than older existing plants in the latter markets, the costs would still be higher than hydroelectric energy from this project.

"The proposed St. Lawrence seaway and power project would develop an estimated 12.6 billion kilowatt-hours in an average water year, half of which would be available to the United States and half to Canada. Again, the generating costs would be very low, thus making bulk transmission to higher cost distant markets economically feasible and desirable.

"In 1950, the Bonneville Power Administration marketed 13 billion kilowatt-hours of low-cost electricity from the Bonneville and Grand Coulee plants on the Columbia River. New projects now under construction should increase the power available for marketing to about 37 billion kilowatt-hours by 1960. The cost of this increased power may be somewhat higher than at present developed sites, but would still be comparatively low."

It concludes the discussion of new possibilities with a review of the atomic energy field. There is every reason to believe that utimately atomic energy will make a substantial contribution toward our electrical energy needs. The present plans to amend the Atomic Energy Act, so as to facilitate private development, will intensify these developments.

While the Commission, in other parts of this report, has stressed the need for tariff reductions and our obligations to our neighbors, including Canada, the following paragraph is of interest as it indicates the attitude our good neighbors take toward our own economy. It said:

"It is presently doubtful that very much Canadian power will be available for use in the United States in view of the established Canadian preference for exporting refined and processed materials (such as petroleum products, pulp, paper, and lumber) rather than promoting exports of raw materials such as crude petroleum, logs, natural gas, and hydroelectric power."

In fact, while the Commission talks of tariff reductions, we apparently have many internal barriers which our people are unwilling to remove, which make it unrealistic to assume that we will remove external barriers. On page 38 the Commission said:

"Another good opportunity is in New England where, because the State of Maine prohibits the export of low-cost hydroelectric power, important hydro potential remains undeveloped. Removal of this restriction would lessen the dependence on high-cost thermal energy for which many New Englanders are now obliged to pay."

Until we have achieved satisfactory levels of employment and income in the United States, few of our citizens will be willing to forego whatever special advantages they may now enjoy.

VOLUME IV

THE PROMISE OF TECHNOLOGY

This volume contains material prepared by outside experts who were retained by the Commission to make specific studies. The only material in the entire volume prepared by the Commission's staff is chapter I. The remaining articles are signed by the authors and constitute an important contribution to our knowledge of the technology in the material industries.

The Commission, unfortunately, did not follow all of the advice and suggestions which they received from their able advisers. The Commission states:

"The common theme of all the papers in this volume is the role technology can play in meeting future requirements of materials. They are offered not as reports bearing the endorsement of the Commission, but rather as studies prepared for the information of the Commission by the various organizations and individuals whose names they bear. Several of the original reports have been condensed, with the consent of their authors, because of space limitations."

The character of the studies is indicated by the following paragraph taken from the Commission's foreword to this volume:

"Three special studies on chemicals were prepared: Forecasts for Petroleum Chemicals (covering nonfuel uses of petroleum and natural gas), by a technical group at Standard Oil Development Co., in cooperation with Standard Oil Co. (New Jersey); Coal Products and Chemicals, by a group of experts at the Koppers Co.; and Oil and Gas as Industrial Raw Materials (embracing nonfuel uses), by an official of Universal Oil Products Co.

"Utilization of energy from the sun was discussed in a survey prepared by a former consultant to the Atomic Energy Commission; the report on possibilities of solar energy in this volume is based on this survey. From the United States Forest Service, the Commission received the study by the Forest Products Laboratory at Madison, Wis., on the technology of forest products, covering the recent and prospective impact of technology on both the supply and the use of forest products. When the construction industry was selected by the Commission for a 'case-history' study of opportunities and obstacles in technology, Arthur D. Little, Inc., of Cambridge, Mass., was asked to prepare a report on technology in the building industry."

"To all who gave assistance, the Commission wishes to express its grateful appreciation. For their unfailing cooperation in the planning and execution of projects, special acknowledgments are due to Dr. Clyde D. Williams, Richard J. Lund, and Richard J. Anderson, of Battelle Memorial Institute; Dr. G. F. D'Alelio and Dr. A. R. Powell, of the Koppers Co.; Raymond S. Stevens and L. F. Marek, of Arthur D. Little, Inc.; Dr. R. C. Gibbs (Chairman, Division of Physical Sciences, National Research Council) and Dr. John N. Adkins (Earth Sciences Division, Office of Naval Research), Dr. E. V. Murphree, E. K. Burger, and A. D. Green, of Standard Oil Development Co.; Palmer Putnam, former consultant to the Atomic Energy Commission; Dr. Gustav Egloff, of Universal Oil Products Co.; and Lyle F. Watts, Chief, United States Forest Service."

"Contributions were made in other ways than the preparation of special papers. A group of invited experts discussed with the Commission and staff the role technology can play in the future of the materials fields; these experts were Julian Avery, consulting engineer; Dr. Willis Gibbons, United States Rubber Co.; Dr. W. K. Lewis, Massachusetts Institute of Technology; L. F. Marek, Arthur D. Little, Inc.; V. H. Schnee, Minerals and Metals Advisory Board; and Chaplain Tyler, E. I. du Pont de Nemours & Co. The General Motors Co. made available a group of its staff members for a 2-day discussion of the company's technical and other studies on various materials."

Inasmuch as these studies were made for the Commission and do not constitute its conclusion or recommendations, no effort will be made to review them in detail.

TASKS AND OPPORTUNITIES—CHAPTER 1

This chapter was written by the Commission's staff. It is unsigned and differs from the rest of the material in volume IV, which consists of signed articles by unquestioned authorities in the areas of their specialties. This chapter shows that technology creates new demands on our resource base by developing products which require large amounts of known materials and some materials formerly not needed at all. For example, the development of the automobile has imposed demands on our resources of lead which were certainly not anticipated when the industry started, as the early cars had neither storage batteries nor leaded fuels. The automobile has also imposed additional requirements on our reserves of iron ore to produce the steel which goes into each car. The materials mentioned were all known and in use before the advent of the automobile. In addition, technology, through the development of atomic energy, has created demands for uranium, zirconium, and beryllium, which were laboratory curiosities only a few years ago.

Technology also reduces the demands on our resource base by making it possible to use lower-grade ores, as exemplified in the present development of the porphyry coppers in Utah and Arizona.

The Commission is to be commended for its statement "To forgo a new development because it sets up a dangerous materials drain is stultification." This statement is so true; yet it has been disregarded in so much of the Commission's work.

The major tasks for technology, as outlined by the Commission, are the following:

1. To foster new techniques of discovery.
2. To bring into the stream of use materials which so far evade our efforts. The Commission refers to the possibilities of using silicon, the most abundant metal in the earth's crust, which, as a metal, has practically no usage at all today.
3. To apply the principle of recycling more and more broadly. The Commission here refers to scrap recovery.
4. To learn how to deal with low concentrations of useful materials. he porphyry coppers and the recovery of magnesium from the sea are examples of what has already been accomplished. The possibilities of recovering other materials from the sea and of eliminating sulfur from the air are tasks for the future.
5. To reduce the need for scarce materials by substituting others that exist in greater abundance.

The Commission, in this volume, shows that we are not really confronted with an absolute shortage of anything. It is entirely a question of costs and economics. It said:

"In presenting this volume, The Promise of Technology, the President's Materials Policy Commission stresses that an absolute shortage of anything is most unlikely and is not the threat that faces us: the threat is of slowly fading supplies which, if not compensated, could produce a rise in costs to the point of arresting those increases in the standard of living which have up until now constituted America's major contribution to the economics of a truly dynamic capitalism. Advances in our civilian economy must continue—but, no less than military advances against our enemy on the battlefield, they can be turned into disasters by carelessness in assuring the continuity of supplies."

This statement is of great significance as, through technology, we can lessen our dependence on foreign reserves if we can accelerate our developments sufficiently.

The Commission, in discussing sulfur, shows:

"If sulfur deposits suitable for the Frasch process can no longer be found at a sufficient rate, we can use volcanic sulfur, pyrites, pyrrhotite, or even gypsum. With this group as a whole the chief concern is to develop techniques for processing lower grade resources without permitting costs to throttle development."

This is obviously a case of economics and, if market forces are permitted to operate, there is no evidence that these adjustments cannot be made gradually and with little effort or confusion.

The Commission, after making these excellent statements, shows its disbelief in allowing these adjustments to take place without overall planning. It says:

"We must also make sure that mining and processing operations do not unnecessarily disperse some of the material which is being extracted. We must find further ways of recovering and recycling dispersed material so that the total of new material required will be reduced. With this group especially we must find ways of discovering new sources of supply."

There is no evidence that Government bureaus could be more effective in increasing our sources of supply than the efforts of countless thousands of individuals seeking their own self-interest in a market economy. In discussing potential materials, the Commission returns to the possibilities of using silicon as a substitute for scarce metals. It says:

"Can we make it cheaply enough so that it can be widely used as a substitute for scarce metals? What can we do to make silicon useful as a metal? How else can we use it? Can we expand its use in silicones as substitutes for scarce materials? We know how to make magnesium. Can we overcome its defects in fabrication and use?"

This statement tends to give the impression that industry is not attempting to meet these problems—that they can only be met by Government planning and Government spending. Yet most of the developments which have made our present technology possible have emerged from private industry, and not from those who would conduct overall planning on the basis of relieving a potential shortage.

In discussing materials that are both scarce and undeveloped, the Commission says:

"Here the main job is to study every property of these elements and use them as far as possible only where they are essential."

It is not clear who the Commission thinks should study every property of these elements and then decide that they should only be used where they are essential. Inventions and technology are not developed in that way.

In its discussion of chlorine, on page 4, the Commission again shows its belief in interfering with the market mechanism. It said:

"The problem in regard to chlorine manufacture is finding sufficient outlet for the caustic soda produced along with it. For each pound of chlorine 1.1 pounds of caustic soda are produced, and a fair amount of cheap power is needed. Due to the rapidly increasing use of chlorine in solvents, plastics, and public water supply, it is expected that the annual demand for chlorine by 1975 may increase to approximately 8 million tons. The demand for caustic soda, on the other hand, is expected to rise to only about 5 million tons. The delicately balanced economics of salt as a source for chlorine may thus be badly disturbed, unless some use is found for the 4-million-ton surplus of caustic soda.

Most of this surplus could be converted into soda ash (sodium carbonate) and find a market in the glass, pharmaceutical, and other industries, provided that some of the power charge now contained in the price of caustic soda could be shifted to chlorine without disturbing its market. Any substantial rise in the cost of power itself would further complicate this solution. The alternative is to make the additional chlorine needed from sources other than salt, such as byproduct hydrochloric acid. This will require the development of more suitable processing techniques than those now available."

There is no indication in the above statement that the Commission is aware of the fact that market forces would automatically adjust the price of caustic soda, soda ash, and chlorine without any outside interference, and that the price adjustments in themselves would stimulate additional uses for the caustic soda.

The Commission summarizes its discussion of the dominant materials as follows:

"Summarizing the problems to be tackled in connection with our dominant materials, we find that:

"(*a*) We must find ways in most cases (potash, aluminum, phosphate, iron ore) of using lower grade resources without increasing cost.

"(*b*) We must improve details of processing techniques so as to increase output per plant unit, by such means as more rapid reduction of iron ore; the use of oxygen in various types of blast furnaces and in the making of steel; the development of new steelmaking furnaces; and the development of new types of electrodes for the production of aluminum.

"(*c*) We must study byproduct recovery, such as the recovery of fluorine wastes in aluminum production and wastes of sulfur in smelting operations, in petroleum and natural-gas refining, and in the combustion and cleaning of coal.

"(*d*) We must find ways of recovering waste products such as iron and sulfuric acid from pickling liquors by techniques like reconcentration, ion exchange, etc.

"(*e*) We must find means for more complete extraction of coal from the mine, and more efficient methods for utilization of coal in the production of heat and power, in competition with liquid fuels.

"(*f*) We must find means for minimizing increases in the sulfur content of metallurgical coke, and for minimizing the deleterious effects of such increases in the resulting iron and steel.

"(*g*) We must develop new methods of desulfurizing and dephosphorizing steel.

"(*h*) We must develop cheaper sources of power, or at least prevent serious increases in cost of power, for such operations as the manufacture of phosphorus, nitrogen, aluminum, and chlorine."

The Commission discusses the problems of the relatively scarce materials in general use. It is particularly concerned with the recovery of scrap. It makes this suggestion:

"On commodities which reach a high production rate, it should be possible to stamp, emboss, or mark an identification number or symbol on each item as it is produced. This system would establish positive identification of scrap and would make its collection attractive due to ease of sorting. The remelting of such scrap would require a minimum of refining, would be more economical in power consumption, and would be more efficient in the recovery of the elements involved. Less primary metal would be consumed in the secondary metal industry because the remelted scrap would contain fewer contaminants, which frequently have to be diluted by addition of primary metals in order to meet chemical specifications. It may even be possible to restamp some products which require machining. A national code would, of course, have to be established to keep the system from becoming unwieldy."

This is another horrible example of the type of overall planning which the theoretically minded members of the staff of the Commission would impose on American industry. How highly polished machined parts would be stamped is not considered. While the Commission was conjuring up plans of this nature, industry was busy perfecting devices that would permit easy and simple segregation of scrap.

The Commission concludes its discussion of the problem materials as follows:

"The technical jobs to be done in connection with problem metals include:

"(*a*) New discovery of all these metals.

"(*b*) Improved mechanical mining methods, like those developed for coal and evolving in copper mining, to increase tonnage mined per man, thus enabling economical treatment of lower concentrations of ore.

"(*c*) Improved milling, especially in the substitution of more efficient grinding methods for present ball mills, which would cut costs by reducing power consumption.

"(*d*) Evolving methods of making flotation applicable to the oxide-containing ores of copper, lead, and zinc as well as to their sulfides, perhaps with cationic flotation agents.

"(*e*) Studying and applying processes for extracting metal values from worked-out mines, waste dumps, tailing piles, and mixed ores. An example is the sulfuric acid leaching process for copper. Other leaching methods should be developed for other metals. Ion exchange methods, such as have been applied to the separation of copper and zinc, should be studied and applied to various tailing waters.

"(*f*) Investigating and developing other new separation techniques such as: vacuum distillation which recovers zinc from zinc-lead mixtures (formed by electric furnace treatment of the mixed oxides) and lead sulfide from lead ore, followed in this case by electrolysis to lead and sulfur; addition of metallic copper to a complex copper-zinc ore to form copper sulfide with subsequent distillation off of zinc and treatment of the copper sulfide in the conventional process to recover the copper.

"(*g*) Improving roasting techniques, such as fluidized-bed roasting, to get better control of the operation, as is done in the prevention of zinc ferrite formation in the roasting of zinc ores.

"(*h*) Recovering byproduct metals such as columbium, tantalum, and tungsten from tin and other ores.

"(*i*) Applying best known techniques to the whole metals industry, as for example: use of continuous vertical retorts, which can improve recovery by as much as 10 percent, instead of the horizontal retorts still used by 80 percent of

the zinc-smelting industry, and use of better washing and filtering techniques, such as the reverse leaching practices followed at the Monsanto plant of the American Zinc Co., where leaching acid is added to excess roaster calcine instead of the reverse, thus preventing much of the present leaching loss.

"(*j*) Researching to develop better ways of making more efficient alloys with less of scarce additive metals, and to make practicable the substitution of alloys using boron, nitrogen, and other relatively plentiful materials, and of new metals such as titanium for alloys using scarce additive metals.

"(*k*) Discovering materials, whether metal or not, which can retain strength at very high temperatures and which can substitute for additive metals."

Throughout the report the Commission shows its concern with the dissipation of lead through leaded gasoline. On page 17, in discussing the tasks for hydrocarbon technology, it states:

"The jobs to be done in hydrocarbon resources are:

"(*f*) Developing the gas turbine for automotive use to make possible the utilization of more available liquid fuels without antiknock properties."

This is an amazing suggestion, in view of the fact that every gas turbine engine developed to date makes a far more extravagant use of petroleum than does a reciprocating engine. One may well question whether it is not better to waste a little lead than to waiste a lot of petroleum. Furthermore, all known gas turbines operate at such high temperatures that their construction requires nickel, molybdenum, tungsten, cobalt, and similar materials which are more difficult to secure than lead. In fact, at the present time, it would be impossible to manufacture very many automobiles using gas turbines, as the high-temperature alloying materials are just not available. Pehaps at this point the Commission would suggest that we do away with private cars and just build buses.

This introductory chapter is completely out of keeping with the high quality of the remainder of volume IV.

VOLUME V

Volume V contains selected reports to the Commission, many of which are the individual expressions of their authors. No attempt has been made to review this volume in detail, but a review of report XVII entitled "Stockpiling Materials for Security," starting on page 147, is included herein. This report to the Commission was prepared by Horst Mendershausen, economist of the Federal Reserve Bank of New York.

CHAPTER XVII. STOCKPILING MATERIALS FOR SECURITY

REPORT 17

A summary of the report follows:

"Materials security policy is concerned with assuring a supply of basic materials sufficient to cover essential military and civilian needs in time of major military conflict. Strategic stockpiling is one of the means.

"The first problem in this field is that of choosing between, and of combining, stockpiling, and other means of materials security policy.

"The second problem of interest is the efficiency of stockpiling—of maximizing the security effect while minimizing the cost (economic, political, and military) of the operation.

"The third problem is the interaction between strategic stockpiling operations and the distribution of raw materials.

"A large stock of basic commodities either accumulated or being accumulated becomes a factor in the markets for those commodities. Prior to the advent of conflict strategic stockpiling tends to compete with demands for other uses at home and abroad, to stimulate price increases—and possibly supplies, or to prevent the appearance of surpluses. Releases of materials from stockpile, as far as permitted, may then compete with supplies from other sources and relieve shortages of materials in current use. The problems posed by stockpile purchases and release during and after the conflict are not considered here.

"Although United States strategic stockpiling aims at completion in the relatively near future, it is likely that the three problems will remain over a longer period of time. Their clarification is needed not only for the few years of stockpile accumulation that are now foreseen but for the longer run in which both further accumulations and stock disposals may be objects of public policy.

"The declared intent of the Stockpile Act 'to decrease and prevent wherever possible a dangerous and costly dependence of the United States upon foreign nations * * * in times of national emergency,' rests on recognition of the calamity that hostile interference with raw material supplies could bring to an unprepared United States economy.

"Stockpiling is a cheap way of insuring materials security. For example, the provision of enough manganese sufficient for a 5-year war from low-grade domestic deposits would probably cost more than the carrying expenses of the total stockpile of all materials up to now.

"Curtailing consumption during a war is an alternative to providing supplies from a stockpile. In large measure the purpose of the latter lies in the avoidance of the former, but the supply program should not be burdened with allowance for unnecessary, uneconomical, and technologically backward uses.

"It is reported that in the steel industry a slight change in specifications with regard to manganese content could save substantial amounts of manganese ore without detriment to quality."

There is some quesion as to the validity of this statement. Most of the manganese is used as a deoxidizer and desulfurizer and does not enter into the finished steel. Therefore, the question of specifications is not involved.

"Readily available domestic resources and facilities of raw materials production are an obvious alternative to stockpiles. Where they do not exist or are

insufficient, the lack may be overcome by additional development or by substitution. This alternative combines the provision of materials security with the economic development of the country; it may furnish economic returns prior to as well as during the emergency.

"The relative economic advantages of stockpiling increase as the cost of marginal production climbs and the price differential widens between purchase time and emergency time. To this may be added the security advantage of certain possession.

"Manganese offers a case in point. Roughly speaking, to raise United States self-sufficiency in manganese from the present approximate 10 percent to 100 percent would require at least a doubling of the price for the bulk, if not all, of domestic manganese, apart from the solution of some remaining technological problems. The cost of manganese self-sufficiency thus would be extremely great, incomparably higher than the cost of stockpiling sufficient amounts of ore. Considerable weight falls on the assumptions concerning the time rate at which stockpiling could be advanced to a point of satisfying emergency needs within the time available. Stockpiling alone might add up to too little. On the other hand, expansion would require time as well and within that time constitute a much greater drain on resources than stockpiling.

"The Stockpile Act charges the Departments of the Interior and Agriculture with certain measures aiming at the development of additional domestic sources for strategic materials. The Departments are to make investigations of the occurrence and utilization of materials, look for new methods or substitutes, and make explorations, demonstrations, and cost studies. Until recently the Munitions Board considered the development function as quite outside its own field. Testifying before a House committee in early 1950, its chairman stated: 'The duties of the Munitions Board lie in the acquisition and retention of stocks of materials. * * * The Munitions Board does not construe the act as conferring upon it any specific duties with reference to conservation and development. * * * There is nothing as we see it in any present law which gives us the right or duty to spend the money appropriated for stockpiling purposes in the development mineral properties.'

"The Director of the Bureau of Mines expressed a parallel view at the same hearings. 'The (conservation and development) program of the Bureau of Mines,' he said, 'is designed not so much to assist in stockpiling as to lessen the need for this measure.'

"The acceleration of the defense production program in 1951 and the resulting shortages of many of the critical materials have helped to bring the stockpile and development functions in the Government closer together. Since the beginning of 1951, the stockpile procurement program has placed particular emphasis on the development and expansion of supply sources. General Services Administration has entered into a number of long-term contracts encouraging the expansion of supplies of aluminum, cobalt, manganese, magnesium, and other materials in the United States, and of chromite, columbite, nickel, quartz crystals, and tungsten abroad. Programs developed by Economic Cooperation Administration, and now taken over by Defense Materials Procurement Agency, go in the same direction and will channel nonferrous metals and other materials into the stockpile.

"Present stockpiling is concerned with materials that have been mined or processed to an extent that insures the greatest suitability for storage while still admitting of the greatest variety of possible uses. A general principle that has gradually emerged is to stockpile materials in their 'higest homogeneous form.'

"There are two other ways of storing materials. They could be 'stored' in the ground prior to mining; or highly fabricated products could be stockpiled.

"In-ground storage is a job of exploration and conservation. The material must be found, measured, and kept in the ground. This function is indeed far removed from stockpiling, i. e., the buying of material. The situation differs from development in the important respect that development assistance may lead to stockpiles in hand, while exploration established only a conjectural potential.

"While outside the stockpile field proper, in-ground storage may be a desirable thing for a variety of materials, e. g., petroleum, sulfur, potash, and other minerals. But it may not always be economical compared with stockpiling. Maintenance of the located deposits in easily exploitable form may be costly. Prevention of flooding, combustion, or other hazards may be expensive enough to make stockpiling of the mined product preferable, provided it can be stored. Moreover, in-ground storage would not follow the principle of maximum conservation of manpower and productive resources during a period of war.

"At the other extreme there is the stockpiling of highly fabricated products. This can be justified on the grounds of wartime resource economy, but encounters the objection that fabricated items stockpiled may be too specific to suit unpredictable wartime requirements, and that the expense of fabrication would absorb funds that could otherwise be spent on raw materials.

"The principle of stockpiling the 'highest homogeneous form' of materials has evolved only slowly and has been overshadowed at times by the principle of amassing the largest volume of material at the lowest cost. This second principle has favored the lowest degree of fabrication. It seems that for the price of 1 unit of aluminum, 4 times as much aluminum could be obtained in the form of bauxite; for 1 unit of ferrovanadium, 20 times as much in vanadium ore; for 1 unit of ferromanganese, 22 times as much in manganese ore. As late as in May 1950 the Munitions Board Chairman declared: 'Generally, it has been our principle that we will buy the ore and not go through the process of refining, the expensive process. * * * In other words, we are trying to make our money go as far as we can in building up our reserve.'

"Although the Department of the Interior, the Surplus Property Administrator, and the Aluminum Industry Advisory Committee recommended the forming of an aluminum metal stockpile repeatedly from 1945 to 1949, the Munitions Board defended its stockpiling of bauxite as dictated by reasons of economy. The resulting delay in aluminum stockpiling is unfortunate in three respects: First, owing to their concentration in a few plants, the alumina and aluminum industries in the United States and Canada are vulnerable in wartime. Second, they consume great amounts of electric power that would be more available in peacetime than in wartime. The conversion of the bauxite stockpile into aluminum during the war is beset with strategic risks and economic costs. Third, the great increase in the current demand for aluminum under the new rearmament program has made it extremely difficult to direct aluminum to the stockpile in 1951. After the Second World War (when the Reconstruction Finance Corporation stockpile of 180,000 tons of aluminum was sold to industry) and subsequently, there was aluminum but no money or intent to stockpile it. Today the intent and money are there, but there is too little aluminum."

Mr. Mendershausen's report contains a section on the Buy American provision of the Stockpiling Act. His statement does not support the strong condemnation of this provision contained in the Commission's recommendations in volume I. He says:

"The development of foreign resources may offer alternatives to domestic stockpiling, possibly in the form of stockpiling on foreign soil, or it may feed into the United States stockpile. Up to now it has worked in the latter direction. The Economic Cooperation Administration endeavored to increase supplies of strategic materials to the United States from dependent overseas territories of European countries and from other places. A substantial part of the deliveries that have been made so far have been sold to the stockpile. Up to July 1, 1951, ECA purchases for the stockpile amounted to approximately $70 million worth of strategic materials. About $56 million in value of such materials had been delivered to the stockpile. Various exploration and development projects are underway.

"Materials of foreign origin necessarily play a major role in stockpiling. This follows directly from the use of the basic criteria of strategic scarcity. Even so, Congress wrote a Buy American provision into the Stockpile Act over the President's strong objections, and it has been the responsibility of the Munitions Board (a) to determine with respect to which materials the application of the Buy American Act would be in the public interest, and (b) to set the maximum margin above market prices that could be paid to domestic producers. By May 1950 the stockpile had bought domestic manganese, beryl, and chrome ore at prices beyond the going world price. It was then following the ruling of limiting the allowable price marking to 25 percent above world price, plus any tariff. This rule is no longer applied rigidly. The Board is now under instructions to judge the reasonableness of a price differential in each particular case and to exceed the 25-percent limit in exceptional cases justified by strategic urgency. By June 30, 1951, 77 percent of the materials-purchase expenditures under Public Law 520 had gone for foreign materials."

In view of the fact that 77 percent of the materials-purchase expenditures under Public Law 520 have gone for foreign materials, there is no evidence that the Buy American Act has hampered the Munitions Board in any way. Furthermore, Mr. Mendershausen shows that:

"It may be noted here that on June 30, 1951, stockpile inventories of 39 materials accumulated under Public Law 520 consisted entirely of stuff of foreign origin, while only 4 stockpiles (sapphire and ruby, molybdenum, magnesium, and lubricant-grade flake graphite) consisted of domestic materials only. Apart from the latter 4, the proportion of domestic materials in the total stockpile (expressed in terms of material-purchase cost) exceeded 50 percent for only 6 materials: Aluminum, 99 percent; cadmium, 93 percent; bismuth, 77 percent; zinc, 74 percent; vanadium, 67 percent; and lead, 66 percent."

This data gives no support to the recommendation that the Buy American Act should be repealed.

"Since the stockpiling program has been the main arm of Government policy in this field for some time, and since it operates under a special statute, stockpiling has come to occupy a central position. The agencies in charge of it, in particular the Munitions Board and the Interdepartmental Stockpiling Committee, have been concerned primarily with the building up of the stockpiles. It has not been their function to chart alternative programs. Quite understandably, they have been partial to stockpiling.

"Effective administrative machinery has been developed in the Defense Production Administration in order to meet the short-run problems of coordinating stockpiling with related activities. In the fall of 1950, the stockpile programs collided with requirements of industry for raw materials, and as a result the Munitions Board was refused automatic access to stockpile acquisitions. The need for a closer dovetailing of stockpiling with other essential requirements was strongly felt, and the responsibility was given to the Vital Materials Coordinating Committee (later renamed Defense Materials Operating Committee), an interdepartmental organization under DPA chairmanship. Since early 1951, this committee has labored to fit stockpiling needs to direct military procurement, indirect defense production, and civilian production and exports. In the process it often had to deny materials to the stockpile even if they had been ordered and bought for the stockpile.

"There have been critical statements about overstockpiling and understockpiling of various materials at certain times. The Senate Preparedness Subcommittee (Johnson committee) accused the Munitions Board of 'dawdling idly over the tungsten stockpile' since the Second World War, and of 'failing clearly and miserably in its responsibilities for wool. On the other hand, excessive United States stockpiling was a target of British and other Allied criticism in later 1950; and economic observers remarked that light buying in slack markets and heavy buying in the boom showed the commercial ineptitude of the stockpilers.

"Undoubtedly the rate of stockpile acquisition has varied greatly.

"The really difficult problem of efficiency in this program is to find the best balance at a given time and in advance. This would have been somewhat easier if appropriations and contract authorizations for the total contemplated stockpile had been asked for and obtained at an early time, although even then there would have been opportunity for misjudgments in use of funds. As it was, annual requests and appropriations helped to make stockpiling subject to changing political moods today, and forced feeding tomorrow, have been a cause of waste in the program despite many efforts to make its detail efficient. For instance, instead of the approximately $550 million that were spent in fiscal 1951 on acquisitions of materials (raising the physical volume of the stockpile by about 54 percent) probably only about $300 million would have had to be spent to obtain the same rise of volume at December 1949 prices.

"The National Security Resources Board has general responsibility for coordination of the program and for recommendations to the President on issues of policy. It has exercised the function of a review body until the beginning of 1951. Prior to the establishment of the Defense Production Administration, stockpiling led a life of its own as the sole economic arm of national security policy—besides such functions as provided in the Rubber Act of 1948, the Tin Act of 1947, and the Abaca Production Act of 1950. Beginning about February 1951, stockpiling became one segment of materials security policy, one public claimant among others for scarce resources. Since then, the review work has moved into the Defense Materials Operating Committee (DMOC) of the Defense Production Administration and at the same time has become more operational in nature.

"The Defense Materials Operating Committee now is in the focal point for the formulation and coordination of policies and programs for materials that

are essential for the defense effort. It holds the check reins on the stockpiling program, with authority in matters pertaining to current additions to and withdrawals from the stockpile.

"The membership of Defense Materials Operating Committee includes representatives of Defense Production Administration, National Production Authority, Defense Minerals Administration, General Services Administration, Defense Materials Procurement Agency, Commodity Credit Corporation, Mutual Security Administration, Munitions Board, and State Department, National Security Resources Board, Budget Bureau, Reconstruction Finance Corporation, and National Shipping Administration as observers. Nearly all member agencies are also represented on the Interdepartmental Stockpiling Committee, usually by the same individuals."

While stockpiling has direct economic effect on this Nation and the other nations of the free world, there is a serious question as to whether as many agencies with interests other than the military security of the country should have the right to "hold the check reins on the stockpiling program."

This committee with its State Department representation is undoubtedly responsible for the fact that the International Materials Conference was permitted, contrary to Public Law 520, to curtail current additions to the stockpile.

"In giving strategic guidance to the Munitions Board, the Joint Chiefs of Staff (JCS) have made assumptions as to the probable duration and general scope of future war and have assessed the military accessibility of various areas in the world and the extent of transit losses. These assumptions are matters of opinion and it is well to realize that change in them could have great effects.

"The Munitions Board generally assumes that in wartime domestic material supplies will become available in accordance with current production trends, from facilities operating under normal schedules, and with present technology. These assumptions are conservative, except insofar as they imply the absence of hostile interference with domestic economic processes. The Board assumes that supplies from militarily accessible foreign sources will become available and that the United States will continue to import its share from them. The latter assumption is also conservative, partly in view of the fact that the United States is likely to carry an abnormal industrial supply load in a wartime alliance and to attract a corresponding share of materials.

"The factoring system, a method of discounting supply estimates, was introduced in mid-1950. It was corrected and its objective-boosting effect reduced at a time when the limited nature of the Korean war was more clearly seen. Over this period, from mid-1950 to 1951, may stockpile objectives fluctuated with the appraisal of the international danger. Still the casual connection between the political events and the change in techniques was not close. A review of the supply estimating technique had been in process since May 1949 and the adoption of the factoring system had been under discussion through most of 1950. For a while the discussion was deadlocked between the Munitions Board (which had been relying on JCS guidance alone with regard to accessibility and shipping losses and wished this guidance to encompass the elements of political reliability and supply concentration as well) and the Department of the Interior, which proposed complete discounting of all foreign supplies in wartime. Interior's proposal would have raised stockpile objectives and purchases drastically. NSRB finally arbitrated the dispute in favor of the factoring system, which put responsibility for political assumptions on the State Department and thus broke the exclusive dependence on JCS guidance."

Here again the State Department apparently is playing a major part in the determination of stockpile objectives. It would seem that this resposibility should lie with the Joint Chiefs of Staff and the Office of Defense Mobilization, and that the political assumptions should be based on reports by the Central Intelligence Agency.

"An appropriate additional factor might be the vulnerability of domestic, or better, North American materials supplies in wartime. Such vulnerability undoubtedly exists in a general way, through disruptions that enemy interference may produce here and there in the flow of supplies, and in a special way where supplies of some materials go through specific bottleneck facilities (e. g., alumina plants). Domestic or continental minerals production facilities as such are probably not particularly vulnerable, but the flow of materials through the economy is vulnerable. The Munitions Board recently requested the Interdepartmental Stockpile Committee to study the problems of balancing this vulnerability by better provisions regarding the nature of stockpiles, and by dispersal or duplication of bottleneck facilities, including the storage of replacement parts and units."

Mr. Mendershausen's report contain a section on stockpile disposals which is quoted in full:

"In ordinary times, the Munitions Board may dispose of materials in excess of needs as a result of a revised determiation. But the disposal cannot take place until 6 months after publication in the Federal Register and the transmittal of notice to Congress indicating the reasons, the amounts involved, the disposition plan and the date when the material will become available. The disposal plan must be specifically authorized by Congress unless the revised determination is by reason of deterioration or obsolescence of the material. For ordinary times, Congress obviously intended strategic stockpiling to be a one-way flow of materials. No disposals have been requested by the Munitions Board under these provisions. Disposal of stocks to prevent deterioration (called rotation) compensated for by an equivalent intake of stocks, is at discretion of stockpile authorities. It is beginning to play a large role.

"The Stockpile Act further provides that materials in the stockpile may be released for use, sale, or other distribution, when, in the judgment of the President, such release is required for the common defense, or in time of war or during a national defense emergency proclaimed by the President, on order of such agency as may be designated by the President.

"The President's powers under these provisions are broad. They have been used in four instances since the proclamation of the national emergency in December 1950. In May 1951 the President ordered the release of 370,000 pounds of tungsten powder, and in August 25,000 tons of copper for allocation and sale to industry. The copper was released with the understanding that an equal amount would be returned by June 30, 1952. The release was designed to offset strike losses. A second order released 30,000 tons. Release of 30,000 tons of lead was authorized late in 1951.

"Stockpile surpluses (or 'overages') have resulted mainly from the taking over of the Second World War Government surpluses. They may also develop through the lowering of estimated wartime deficits. In principle, sizable excesses of inventories over the latest accepted objectives should not be carried, since the funds invested in them could be put to better use. But in practice, the Munitions Board has adopted the policy not to declare any stockpiled material in excess unless it is perishable or subject to specially high-shortage costs. In some cases the appearance of an 'overage' has been prevented only by the stockpile authorities' refusal to lower objectives below inventory levels, although deficit calculations would have permitted that. The Munitions Board does not want to find itself in a position where it would have to request purchases of a material that had previously been found in excess and had been sold."

Mr. Mendershausen stresses that:

"The stockpile alone provides no 'security in depth.' It must be accompanied by measures that enhance the reserve powers of domestic and free world materials production, the capacity to substitute one material for another, and the capacity to economize in the consumption of materials, including the elimination of waste. The stockpile is a static defense against shortage.

"The most important shortcoming of the present stockpile is that it is not full. Since it is practically impossible to differentiate between strategic materials according to essentiality—apart from the determination of the size of specific objectives—that rule should be to fill all objectives as promptly as possible. At present there is considerable variation in the degree of their fulfillment. In mid-1951 the percentages varied between 0 and 184. The strategic stockpile inventory is not evenly balanced.

"The most important imbalances are the deficiencies but a few of these deficiencies will disappear as some objectives are revised downward. Other deficiencies may be lessened, for the same reason. In large measure this reflects the development of 'security in depth' that has begun in 1951 in the fields of substitution and expansion.

"The availability of materials—at the source and to the United States—may or may not allow the Munitions Board to reach its target date for completing all objectives. Allocations by DPA may limit rate of progress but expansion of materials production may accelerate it perhaps enough to complete some objectives even sooner than the present stockpile program alone promises to do."

Again it should be noted that Mr. Mendershausen stresses that the most important shortcoming of the present stockpile is that it is not full. Yet we permitted the so-called resentment of other nations to curtail our stockpiling program.

Mr. Mendershausen analyzes the economics of stockpile purchases since the emergency.

"The changed connection between stockpiling and materials markets materialized about 9 months after the Korean invasion. The events of this period brought out the dangerous inflationary impacts of active stockpiling in a noncontrolled economy.

"The fears of impending war that arose led to expectations of shortages, to large Government expenditures and to stringent controls, and induced governmental and private stockpiling of vast amounts. The procurement authority for the stockpile in fiscal 1951, originally scheduled to provide a net amount of only $500 million, was raised by $600 million in September 1950, and by another $1,835 million in January 1951. The inflationary expectations created a readiness among businessmen to bid eagerly for materials.

"But actual stockpile contracting did not increase commensurately with these expectations. In the second half of 1950 obligations rose only 7 percent. But the rate of contracting in the first half of 1950 had been well above 1949, and arrival of materials in the latter part of 1950 reflected this earlier rise. Thus, although new buying immediately after Korea was hardly more active than before, the value of the stocks on hand rose by 75 percent in the second half of 1950. The volume increased about one-third.

"Contract obligations rose to a peak in the first quarter of 1951, amounting to nearly a billion dollars in these 3 months as compared with $430 million for the preceding 6 months. This large obligation of funds was more in line with the public discussion in the summer and fall of 1950 than were the actual contracts in the second half of 1950. If it had occurred in 1950, a major share of the price increases then occurring might have been correctly attributed directly to stockpile purchases. In the first quarter of 1951, however, most materials prices began to decline. During the second quarter, when the rate of contract placement fell to less than $700 million, prices continued to decline or were steady.

"Probably more important than the direct impact of stockpile puchases on markets in the second half of 1950 was a wave of speculative purchases by domestic and foreign buyers, probably exceeding Government stockpile buying.

"The rise in materials inventories in manufacturers' hands was nearly three times as great as the rise in the monetary value of strategic stocks on hand during the second half of 1950. A substantial part of it was due to higher replacement costs, but the share of price inflation was probably smaller than for the strategic stockpile. It is safe to say that inventory building was many times greater than stockpile acquisitions.

"A major part of the increases of manufacturers' and traders' stocks is financed with bank credit. A British statement attributing the boom in raw materials prices to United States monetary policies rather than to stockpile purchases, came close to the mark. If the great expansion of private credit for inventory buying could have been prevented in this country, the prices of basic materials certainly would have risen less."

This discussion is significant in that it really shows that domestic credit policies played a large part in the materials shortages and in the inflation of world material prices. If the credit expansion, which took place following Korea, had been prevented through proper action by the Federal Reserve Board, there would have been less pressure on the commodity markets.

Mr. Mendershausen continues: "The wave of raw-material buying issuing from the United States released similar developments in other parts of the world. The effort to build stocks spread through continental Europe. China and the Soviet Union added heavy purchases of rubber and other materials to the high demands of western countries.

"In the Western World outside the United States, strategic stockpiling was of little significance in the second half of 1950, but various countries encouraged private stockbuilding. Strategic stock reserves began to be formed in the United Kingdom toward the end of the year, apparently aiming at the creation of a reserve equal to 1 year's consumption. Some British Government stocks, e. g., tin, were transferred to the strategic stockpile. But the expenditures on stockpiling foreseen in the United Kingdom budget for 1951–52 could not do much more than offset the decline in the overall volume of Government stocks in the previous year; and these expenditures did not materialize. Allocation plans for copper and zinc prepared by the International Materials Conference include allocations to several other free world countries for stockpile purposes."

Mr. Mendershausen's report was completed during the middle of 1951 and therefore does not mention the fact that the International Materials Conference actually stopped stockpiling acquisitions by this country.

During the latter part of 1952 the Defense Materials Procurement Agency started to accumulate lead outside of the strategic stockpile under the authority of section 303 of the Defense Production Act.

Mr. Mendershausen says: "Purchases for the strategic stockpile are but one element of United States Government buying of strategic materials. Purchases under section 303 of the Defense Production Act run alongside stockpile purchases and overlap with them. This section 303 empowers the President to make provisions 'for purchases of or commitments to purchase metals, minerals, and other raw materials, including liquid fuels, for Government use or for resale' on liberal terms. (Public Law 744, 81st Cong., 2d sess.) Approximately $2 billion have been authorized. By August 17, 1951, $1.7 billion of that sum had been committed by Defense Production Administration. Materials bought under section 303 have gone and will go into industrial use, or into the strategic stockpile with reimbursement from stockpile funds.

"The potential buying power of the Government is farther from being exhausted, however, than these figures suggest. The Defense Production Act amendments of 1951 specified that liabilities incurred in buying materials should be counted as an obligation only to the extent of thep robable ultimate net cost to the United States under such transaction. Since this cost would be the excess of the purchase price over a future resale price and is likely to be negligible in most cases, the Government's borrowing power may finance virtually unlimited purchases, so long as the bulk of the outlays is being recouped by sales to stockpile and industry. It is therefore now anachronistic to consider the strategic stockpile operation an independent cause of market impacts. In today's partly controlled economy, stockpile and current consumption demand are so closely interwoven that a realistic discussion of market impacts must concern itself with the aggregate demand for materials at any given time."

The question may be raised as to whether sufficient thought has been given to the possibility that the Government will completely dominate the metal markets under the authority of section 303 as modified by the Defense Production Act of 1951, which provides funds for unlimited purchases of materials for sale, either to the stockpile or to industry. The abuse of these powers must be prevented at all costs.

Mr. Mendershausen summarizes his report as follows: "Strategic stockpiling has been developed into a first-rate instrument of materials security policy. With the help of transfers of materials from Government surpluses and ECA, the Nation by mid-1951 had filled about one-third, on the average, of the estimated deficit of strategic and critical materials needed in a future major war. The stockpile has considerable economic merits, for the large acquisition cost will be recouped when the stockpile is used. The cost consists really of the outlay for maintenance and administration.

"The most important deficiency of the present stockpile is that it is not full. For many important materials the fulfillment percentage is above one-third, but for others it is below. Supply difficulties and competing essential demands may retard purchase activities and cause diversions of stockpile purchases to other uses and even withdrawals from stockpile inventories, but it must be expected that better purchase opportunities will appear when the output of various materials expands and defense production requirements level off.

"The stockpile objectives for the accumulation of materials rest on judgments of the nature and the duration of a future conflict. These judgments generally appear conservative. The objectives are revised repeatedly in the light of new facts and expectations, and more revisions are to come. Strategic and political guidance is given by the Joint Chiefs of Staff, the State Department, and the Central Intelligence Agency. Current stockpile planning does not make allowance for the vulnerability of materials production and transportation facilities on the North American continent. This vulnerability may, of course, be reduced by protection, dispersal, or the duplication of plant and equipment, but stockpile planning could add its part to these measures by accumulating materials in forms that no longer depend for further handling on obvious strategic bottlenecks. Stockpiling of materials at somewhat higher stages of fabrication—consistent with wide usefulness—and accumulation of stocks of some essential materials that are not strategically scarce in a foreign-trade sense would help to shift the expenditure of labor, electric power, and other general resources from a future war period into the present.

"Since the advent of the Korean emergency, the coordination of stockpile acquisitions with other current requirements for materials, domestic and for the

free world, has made much progress, although this coordination has kept the strategic stockpile from growing as fast as its financial resources would have permitted. The coordination has been chiefly on a short-term basis, with allocation of current materials supplies as its focus. The function of planning for security in depth has not been exercised vigorously."

The fact that stockpiling acquisitions have not kept pace with the financial resources appropriated by the Congress is of serious concern. Diversions of materials under stockpile contract have taken place and there is evidence that much of the material diverted was diverted for use in the civilian economies of other countries through International Materials Conference allocations. If a stockpile is justified as a security measure, then there can be no acceptance of the philosophy that the rate of our stockpiling program should be negotiated with other governments through an organization such as the International Materials Conference.

REPORT TO THE PRESIDENT BY THE NATIONAL SECURITY RESOURCES BOARD

On December 10, 1952, the National Security Resources Board made a report to President Truman in which it specifically discussed the 78 recommendations made by the President's Materials Policy Commission. This report was made pursuant to the President's request, so that the necessary implementation of the Paley report could take place. No useful purpose would be served at this time in reviewing this report in detail, as the National Security Resources Board no longer exists. Its functions were transferred to the Office of Defense Mobilization under Government Reorganization Plan No. 3, which was submitted by President Eisenhower early in 1953. Furthermore, the report is based on the comments of Cabinet officers and department heads who have all since been replaced by new appointments. The report should be studied, however, as many of the second echelon career personnel who were really responsible for the recommendations made by the former department heads are still in key positions in the departments.

The report accepts without qualification the basic tenet that we have become a have-not nation. It discusses our dependence on foreign materials as follows:

"A second objective of materials policy is the more efficient production, distribution, and use of materials throughout the free world. This is consistent with the first objective to intensify the exploitation of domestic resources and is a further application of the least-cost principle. In this context, use of domestic resources should be buttressed by the use of low-cost foreign raw materials wherever possible. In furtherance of this objective, a necessary corollary is the improvement of conditions under which private United States investors can operate abroad.

"This improvement should apply to:

"(1) The improvement of the general climate for investment abroad, and the facilitation of direct negotiation by private United States investors with private interests abroad or, as necessary, with the governments of foreign producing countries.

"(2) The further development of a United States tax program that would encourage private United States foreign investment.

"(3) The further development of guaranties against abnormal nonmarket risks.

"(4) The reduction of trade barriers, to facilitate the import of low-cost foreign raw materials.

"Private investment is being inhibited in many areas of the world upon which we are dependent for strategic raw materials by the necessity for the improvement of agriculture, power, transportation, ports, and other basic services which are necessary to materials development at economic costs. The flow of private United States capital into new mining enterprises overseas can be encouraged further through point 4 assistance to countries to meet these problems. Such assistance by the United Nations or the United States will also be useful in encouraging other nations and private citizens thereof to undertake the exploration for, and the exploitation of, raw materials essential to national security. An additional incentive to the same objective of investment abroad is the possible United States Government guaranty against abnormal market risks of loans by private United States institutions to private United States investors overseas and the further use of direct loans by existing national and international agencies to encourage raw-materials development. Still another step to encourage the desired investment is the reduction or elimination of tariffs so as to assure to producers abroad access to the United States market for materials in which this country is not self-sufficient. All of these incentives as applied to the development of strategic and essential raw materials overseas are beneficial to the national security."

One of the dangers inherent in this report is shown by the discussion of the first recommendation of the President's Materials Policy Commission. This was

a simple proposal providing for an intensification of the analysis, fact-gathering and analytical work of the Bureau of Mines and the Geological Survey. This proposal would require the voluntary cooperation of industry in furnishing data to the Government. Among the agencies who were asked to take a position on this subject was the Federal Trade Commission. The Federal Trade Commission, in commenting on the collection of data on a voluntary basis, listed three principles upon which it believed fact-gathering programs should be based. These are:

"1. Fact-gathering programs, though relying so far as possible upon informal and voluntary processes, should, nevertheless, be based upon statutory obligations that can be used where voluntary processes fail;

"2. Fact-gathering by the Government should not be pursued under conditions which enable parties or associations to bargain with the Government as to the use of the data; and

"3. Use of the data should be determined upon grounds of propriety and public interest and should not preclude proper uses within Government or proper publications."

The purpose of the Paley Commission recommendation was to improve the information available to both Government and industry in appraising the materials position of the United States. The Federal Trade Commission was apparently more interested in securing the data for punitive purposes than in fostering the collection of useful information. Furthermore, it wished to have a free hand in publishing the material which hitherto had been furnished to the Government on a confidential basis. Certainly, cooperation between Government and industry cannot be attained by such an approach. Fortunately, some of the personnel responsible for such recommendations by the Federal Trade Commission are no longer with the Commission. Similar comments could be made in connection with many other recommendations by the National Security Resources Board, but no useful purpose would be served by an analysis of this report at this time.

COMMENTS BY OTHER GOVERNMENT AGENCIES

The report by the President's International Materials Policy Commission has become the standard authority on materials for other Government agencies, ranging from the State Department and the Office of Defense Mobilization to the United States Military Academy at West Point. Enclosed herein are copies of the publication of the Office of Defense Mobilization entitled "Raw Materials Imports—Area of Growing Dependency" which indicates how the findings of the Paley commission were used by the ODM. There are also included pages from the Department of State bulletin of July 14, 1952, and 3 chapters from Economics of National Security, the text used by the United States Military Academy at the present time.

[Office of Defense Mobilization, Office of Public Information, Washington 25, D. C., February 20, 1953]

RAW MATERIALS IMPORTS: AREA OF GROWING DEPENDENCY

PART I

Our raw materials needs, already growing, have been greatly expanded as a direct result of (1) our decision to strengthen our Armed Forces and the industrial capacity to support them, and (2) the tremendous advances of technology which demand a number of raw materials not available in the United States. The size and nature of our mobilization program—limited though it is—means that we need more materials, and different kinds of scarce materials. Many of the most vital ones must be imported.

The situation as a whole has given rise to the emergency measures for the conservation and allocation of critical materials for which the Defense Production Administration is responsible, and to the national stockpile program.

This study has been prepared from many sources in order to provide, in as brief and simple a form as possible, a statement of the great raw materials needs which our defense entails and the growing interdependency of the nations of the free world in this important field. It is in two parts. Part I deals with the background, our defense needs, and the problems of investing abroad to expand our resources supply. Part II examines the sources, the supply situation, and the industrial uses of 27 strategic raw materials which must be imported to meet our requirements.

Parts of the material (e. g., certain statistical relationships in the table in part II) have not, so far as is known, been previously published in this form. A short bibliography appears at the end of part II.

THE PROBLEM

The United States is the world's largest consumer of raw materials, so large that we can no longer supply all our own needs.

With only about 7 percent of the population and the same proportion of the land area of the free world, we consume about two-thirds of all the petroleum produced in the free world area, almost 60 percent of the rubber, more than half of the manganese, iron ore, and zinc, and almost half of the copper and lead.

Our appetite for raw materials has increased at phenomenal rates during the past three decades. Consider, for example, the millions of tons of metals consumed by all the peoples of the world between the time man fashioned the first crude knife blade of bronze and the outbreak of World War I. Huge as this 5,000-year consumption was, United States consumption alone during the past 38 years has exceeded it.

More than 2½ billion tons of materials are used up every year to support our high standard of living—an average of 18 tons of materials a year for each person in the United States.

Transition: Abundance to dependency.—This level of consumption has caused a heavy drain upon our endowment of raw materials. While we will never use

up all our natural resources in an absolute sense, we have nevertheless reached the point in many cases where either we must bring into operation more and more of our marginal resources, which means higher costs and a subsequent lowering of our standard of living, or we must greatly expand our imports. The latter course appears to be the clear choice.

Grim as the prospect may seem to a people long accustomed to abundance of natural resources (one of the better-remembered facts about our country learned in grade school) we are now dependent upon foreign imports not only for luxuries but also for vital necessities.

We became a net importer of raw materials for the first time in the 1940's—a milestone in our development as a nation. In 1945 we began to import petroleum. In about 1935 we began to import zinc, in 1936, copper, and during World War II, lumber. By 1950, consumption of raw materials exceeded domestic production by 9 percent.

How has this fundamental change in American self-sufficiency come about? In the first place, it should be noted that the overall figure of a 9-percent deficit by no means tells the whole story. For some materials there are deficiencies ranging up to 100 percent. Indeed, the idea of American self-sufficiency has always been to a considerable extent a myth. The mangitude of this myth is shown clearly in the case of metals—the base for any industrial civilization. We are in part, at least, dependent upon foreign sources for every metal which we use except for magnesium and molybdenum.

Expanding demand: Two basic causes.—Our expanding demand for metals has been brought about by two basic causes: The first and most obvious is that there are more consumers—our population has almost doubled in the last 50 years. The second cause is the emergence of technology, which has brought about an entirely new pattern of raw materials usage.

The impact of technology, accelerating at increasing rates, is felt in everything we do.

Technology in two interrelated areas must be considered. The first is in the field of new end products—the kitchen range with time and temperature-control gadgets; the jet engine, which in less than a decade has revolutionized air power; the television set in 15 million living rooms; the radar screen along our borders. These end items and thousands of others require mounting use of special metals, many of which a short time ago were curiosities. The second area of technological development is in the field of materials themselves. Aluminum, replacing steel and copper at growing rates, is the outstanding example. The postwar rise in plastics, which in some cases is in turn supplanting aluminum and other metals, is another example.

In the metals field, technology has given us hundreds of new alloys, each with special characteristics for special purposes, and giant strides in metallurgy are taken each year. As a result, new demand for certain alloying metals—some of which have obscure and little-known names—have sprung into being. It is an unfortunate fact that most of these alloying metals which we have come to need must be imported, making us further dependent on nations outside our borders.

But in some areas, technology has decreased our dependency on foreign sources. Before World War II, for example, our two largest import items were silk and rubber. With the growth and development of synthetic textiles and rubber these two materials no longer occupy their old place in our import picture. At the same time the development of synthetics has resulted in the need for more petroleum from which many of them are made.

But despite such developments, the net effect of the growth of technology has been to make us increasingly dependent on imports.

THE NATIONAL STOCKPILE

Growing dependence on imports has brought with it concern over the prospect of a major war in which we are cut off from resource countries. This concern gave rise to the Strategic and Critical Materials Stockpiling Act of 1946.

The Stockpile Act was passed to decrease and prevent wherever possible a dangerous and costly dependence of the United States upon foreign nations * * * in times of national emergency.

Control of the stockpile is in the hands of the Munitions Board, which has set stockpile goals for 75 grades and types of 56 materials. The full stockpile of each of these materials—when supplemented by domestic production and possible substitution—would provide sufficient materials for a major war of many years' duration.

A complexity of factors must be considered in setting goals for each material: the funds available for stockpiling, the effect of purchases on the world market, new uses which arise for certain materials, and so on. Therefore, the rate of accumulation is under constant study, and is revised as the situation may demand. For a number of materials, stockpile goals have already been met or exceeded, but for others there is still a long way to go.

The following commodities are those which we cannot produce domestically in amounts sufficient to meet a major emergency. These are the materials which we are stockpiling:

Abrasives
Aluminum
Antimony
Asbestos
Bauxite
Beryl
Bismuth
Cadmium
Castor oil
Celestite
Chromite
Cobalt
Coconut oil
Columbite
Copper
Cordage fibers
Corundum
Cotton
Feathers and down
Fluorspar
Graphite
Guayule seeds
Hog bristles
Hyoscine
Industrial diamonds
Iodine
Jewel bearings
Kyanite
Lead
Magnesium
Manganese ore
Mercury
Mica
Molybdenum
Nickel
Opium
Palm oil
Platinum group metals
Pyrethrum
Quartz crystals
Quinidine
Quinine
Rare earths
Rubber
Sapphire and ruby
Shellac
Silk
Sperm oil
Talc
Tantalite
Tin
Tungsten
Vanadium
Vegetable tannin
Wool
Zinc

DEFENSE AND RAW MATERIALS

Military production is an avaricious consumer of raw materials. About 15 percent of all the materials consumed by American industry goes to defense industries. But this figure does not represent a 15 percent across-the-board consumption. If it did, our materials problem could be much more easily solved.

Defense consumption of the alloying metals is inordinately high—more than 90 percent in the case of nickel and cobalt—and it is such metals for which we are most dependent on foreign sources.

Improvement in our military equipment may be generally correlated with increased usage of electrical equipment. The old Norden bombsight of World War II, for example, cost only about $8,000 or $9,000. Compare this with the $250,000 bombsight now used on our B–36's—$250,000 worth of the most complex system of electrical wiring, vacuum tubes, and relays.

Radar has become standard equipment in our interceptors; and more and more in all our tanks, ships, and planes manual controls, subject to human error, are being replaced by automatic devices—all of which are electrical.

The new guided missiles, several types of which are in active production, offer perhaps the most dramatic example of the use of automatic control devices.

Copper, quartz crystals, mica, nickel, cobalt, and many other materials are all essential to the manufacture of the electronic equipment of modern war—not only the automatic control and firing devices mentioned above, but also the many communications instruments as well.

Military engines, both jet and internal combustion types for aircraft, and those going into tanks and ships, require metals which can withstand great heat and stress. To give engine parts these properties, the alloying metals—tungsten, nickel, columbium, and others—must be used in very high proportions, much higher than is ordinarily necessary in civilian manufacture.

We often find that further improvement of many military items is directly related to our ability to increase our supplies of certain materials.

But as we look abroad for increased supplies, we find that our allies are also seeking to increase their imports of these same materials for their own defense programs. The free nations of the world all shop at the same market places for these materials. Western Europe, little endowed with resources of its own, has long ago all but depleted most of its own meager reserves.

In a narrow sense, we must compete with the other free nations for the raw materials which we need, but only in narrow sense. Because the goals which we are seeking and hope to attain through use of these raw materials—defensive

strength, and a healthy free world economy—are also the goals of the other nations, the development and the sharing of free world supplies of materials must be undertaken as a great cooperative, rather than an individual effort.

Usually, the normal operation of supply and demand brings capital investment into the development of new resources, and under normal world market conditions, materials are shared among the consuming nations without formal machinery for mutual cooperation.

But when the free-world demand rises sharply for certain materials, some formal method of mutual cooperation becomes necessary.

It was this consideration which gave rise to the International Materials Conference, which was established to recommend a fair distribution of the free world supply of certain materials to each member nation. The IMC has made a useful contribution to the orderly distribution of world supplies and indirectly to the stabilization of raw material prices.

OUR FOREIGN SOURCES OF SUPPLY

Potentially, Africa and Latin America stand first as exporters of minerals. A major share of the free world's present potential sources of copper and cobalt lies in the Congo and in Northern Rhodesia. The vast Amazon region of Brazil has hardly been explored, but many believe it to be the world's greatest storehouse of raw materials. Exploration in Africa has outstripped that in the Amazon region. As a result, important deposits of iron ore, tin, lead, zinc, manganese, metallurgical chrome, columbite, tantalite, and cadmium have all been discovered there in recent years. South Africa and Brazil represent the great and booming frontiers of the future as the demand for raw materials throughout the free world increases.

Two of our largest steel corporations are opening rich iron ore deposits in Venezuela, a country which has long supplied a relatively high percentage of the world's oil production. The production of manganese in Brazil, lead and zinc in Mexico, and bauxite in British Guiana, Haiti, and Jamaica, will all be stepped up.

The whole of Western Europe's oil requirements may eventually flow from the Near East (more than a billion dollars in new capital investment has been poured into the area since the war) and the Near East may eventually become an important exporter to the United States. Tungsten, manganese and mica, tin, and rubber, are the chief exports of the south and southeast Asia—and here, too, potentials of new discoveries are great.

For materials such as oil, iron ore, zinc, manganese, bauxite, and possibly copper, South America, Canada, Africa, and southeast Asia all are believed to have high-grade resources which have not yet been developed or discovered.

The real question is whether capital, equipment, and management skills will be applied to the expansion of low cost sources of supply in the less developed countries. Historically, private capital from Western Europe (and more recently the United States) has been chiefly responsible for the minerals development of the less developed countries—but the rising nationalistic and industrial ambitions of the resource-rich but less developed nations act as a powerful deterrent to private capital.

American private capital now has about $6 billion invested in materials development abroad, of which oil company investments accounts for more than two-thirds. But since the war United States private investment in foreign mining and smelting enterprises has averaged only about $50 million a year. If rapidly expanding minerals requirements are to be met from abroad investment well in excess of previous levels will be necessary. The President's Materials Policy Commission has estimated that for copper requirements alone, an annual investment abroad of $100 million for several years will be needed.

The very nature of materials exploration and development—both at home and abroad—makes it extremely expensive. Sixty million dollars was spent in Colombia by one company alone before oil was first marketed. In other instance, in Venezuela, the first investment was in 1934 and the first discovery in 1940, with almost $27 million invested before the first actual sales in 1944.

Because of high costs, private investment in resource development abroad is generally made only by a few large companies. Not only do these companies possess the means for financing such ventures, but they are able to deduct the costs of explorations from taxes on profits in other activities, which a newly organized minerals exploration company entering the field is unable to do. Those companies with a high profit base from other activities have a distinct advantage over the one-shot investor.

The following section goes into the problem of increasing our investments abroad in greater detail, and points out some of the ways in which the United States Government is attempting to overcome present obstacles to private investment.

THE ROLE OF THE UNITED STATES GOVERNMENT

Exploration and development of resources abroad, the requisite for increased imports, has traditionally been undertaken by private commercial organizations. But the obstacles to private investment in foreign minerals resources are great and act as a barrier to many would-be investors even though the initial prospect for profits may appear extremely favorable.

Since our imports of minerals during the coming years will have to be stepped up in line with our growth and progress as an industrial nation, it is possible that increased governmental support and incentive programs may have to be adopted if existing methods and policies prove inadequate. Both the Paley Commission, from whose report much of the material in this section is taken, and the National Security Resources Board tend to favor increased governmental incentives—but there is disagreement.

Many persons familiar with the problem, both in and out of the Government, believe the Paley Commission to be overly pessimistic in its report regarding our future raw materials supplies. They argue that the Commission taking as it does our expanded requirements 25 years hence (which, admittedly, are great), fails to take into account that the natural orderly resource development during the intervening time may be sufficient to meet our future needs—that the supply-demand factor will assure resource development as in the past.[1]

In any event, the Government has found it desirable at the present time to offer a number of incentives to stimulate investment abroad. These are outlined in the following section.

Investment guaranties.—Since the war, the United States Government through the Economic Cooperation Administration and its successor, the Mutual Security Agency, has insured investors against expropriation and against certain nonmarket risks. Few such guaranties to companies operating abroad have been issued to date.

Removal of tax handicaps.—The Revenue Act of 1951 greatly liberalized the foreign tax credit system. Credits are now available to a United States corporate taxpayer who owns as little as 10 percent of the stock of a foreign corporation instead of 50 percent as formerly. This change should stimulate minority investment and joint ventures in foreign mining.

Technical assistance.—The current United States programs of technical aid give assistance to certain underdeveloped countries in appraising their mineral resources. United States experts have organized local minerals and geologic bureaus in these countries and have trained local experts. United States Government experts also have undertaken certain geological and exploratory work abroad. These programs are being carried out by both the Technical Cooperation Administration and the Mutual Security Administration, but the amount of activity thus far has been limited. Only a little over a million dollars was provided during fiscal year 1952 for assistance directly related to minerals production abroad.

Indirect assistance.—Through loans granted by the International Bank for Reconstruction and Development and the Export-Import Bank for public improvements in transportation, power, and port facilities, indirect contributions to minerals production have resulted. Chrome and manganese production in South Africa was greatly stepped up as a result of a loan to improve transportation facilities. In India the production of manganese, copper, limestone, bauxite, and mica were all expanded as a result of an International Bank loan for additional electric power. Similar indirect benefits to minerals development are taking place in Brazil, Chile, Peru, and in other countries as a result of loans by the International and Export-Import Banks.

Purchase arrangements.—The United States through the General Services Administration and the Defense Materials Procurement Agency has authority

[1] For a detailed commentary on the Paley Commission recommendations, see The Objectives of United States Materials Resources Policy and Suggested Initial Steps in Their Accomplishment, a report by the Chairman of the National Security Resources Board based on comments on the Paley Commission recommendations by the various Federal agencies. The booklet is available from the Government Printing Office. (Superintendent of Documents, 50 cents.)

to offer long-term contracts to materials producers to encourage production for stockpile purposes. The long-term contract usually provides a minimum price guaranty. In many cases the Government need not buy the materials but only agree to buy if the market price falls below a certain level.

Government loans.—When an American or foreign producer of materials abroad cannot raise capital, the Government is authorized to make a direct loan to the producer under certain circumstances. Such loans have been made for the expansion of lead and zinc in French Morocco, for chrome in Turkey, for manganese in Mexico and Brazil, sulfur in Mexico, iron ore in Liberia, zinc in Peru, and tungsten in Bolivia and Peru.

OBSTACLES TO PRIVATE INVESTMENT

Important as the above methods are in increasing the development of resources abroad, their use thus far has been rather limited. Alone they cannot solve the basic problem—the increased participation of American capital in foreign resource development.

This problem results from the very real obstacles facing the United States citizen who might wish to invest abroad.

In almost all foreign countries minerals can be extracted only after obtaining government permission. Specific arrangements with the authorities as to terms and conditions of investments in transportation, housing, the erection of townsites, and other facilities must be made in many cases. Thus, the assurance of a fair chance for profitable operation depends initially upon the terms of a concession and other agreements bargained for with officials of the source country.

Even after the concession has been granted and the operation has begun, the minerals project is always subject to the vicissitudes of legislative and administrative actions. All these things tend to lower the profit margin for investors. The age of the unrestricted semisovereignty enjoyed by mining interests in underdeveloped countries where returns on capital investments were fabulous is indeed over.

The 50–50 split of profits of the type employed by American oil interests in the Middle East, and the corporation-built workers' townships—which in most cases gives workers a standard of living far exceeding the average noncorporation worker in the country—has become the new pattern. It is an enlightened practice, but an extremely expensive one.

Quite apart from the initial obstacle of huge investment, very important legislative and administrative deterrents restrict the flow of capital investment abroad.

These deterrents (taken up at more length in the Paley Commission report) related to the ownership of the corporation, management of the concession, taxation and other exactions, and the convertibility of currency and other regulations affecting foreign exchange and trade.

Limitation of ownership.—Local ownership of all companies engaged in extraction is required by some countries. In French overseas territories, insistence on majority French ownership is known to have caused recent refusals to proceed with development of attractive properties. Brazil has recently nationalized all oil production, and the extent of foreign ownership permissible in other extraction projects in Brazil is not clear, which in itself effectively bars private investment.

Few investors are willing to put up a majority of the capital and accept minority participation.

Restrictions on management.—Local participation in the management and direction of corporations is required by some countries. Investors fear that local minority owners will demand too great a voice in the management or insist on uneconomic use of local supplies and personnel. Frequently, public pressures for auxiliary investment—such as a local steel mill where iron ore extraction is taking place—decrease the investor's willingness to develop promising resources. But at a time when nationalism is underdeveloped countries is on the rise, it is frequently necessary for the investor desiring concessions to undertake projects not connected with his operations.

Other difficulties arise when a company wishes to close down unprofitable high-cost mines in certain areas. The foreign government, thinking of local unemployment and the social effects of the shut-down operations, may forbid such action, and the company, if it is to continue operations within the country, is forced into compliance.

Fixed requirements for the employment of local labor and technical personnel; training to qualify citizens for skilled positions; high severance pay and retirement benefits sometimes required by the foreign government, are all costs which tend to discourage investment.

Taxation and royalties.—In addition to royalties which must be paid in many cases to both local government and to the property owners, minerals extractions—particularly metals—is often subject to gross production taxes. Often these taxes make no distinction between high-cost and low-cost operations. The tax imposed without regard to the investor's costs magnifies the risks of minerals development. The investor's troubles may be compounded since these taxes usually are not allowed as a credit against the United States income-tax liability.

In countries such as Canada, Australia, and South Africa, where exploration expenses can be deducted from profits and where taxes can be postponed, exploration has been greatly stimulated.

Convertibility and exchanges rates.—The cost of doing business in a particular country may often be increased by multiple exchange rates. United States copper companies in Chile, for example, were required in 1951 to purchase pesos for operating expenses at the rate of 19.37 to the dollar as compared to rates ranging from 31 to 94 pesos in other transactions.

But the biggest problem is the difficulty of converting earnings into dollars. Investors consider this a major deterrent. Brazil allows investors to return only 8 percent of the investment each year to the United States.

Import and export controls.—Many countries with to control sales in world markets and to enforce local processing and fabrication. As a result, the materials which are extracted are allocated between local and foreign markets by means of export controls. In a few cases, investors have been barred from importing equipment, and have been forced to use inferior and costly local supplies and equipment.

Fear of expropriation.—Actions such as Iran's recent nationalization of oil interests within its borders are feared by all those making investments abroad. No matter how satisfactory the terms and conditions of original agreements, most investors have a very real concern lest source countries violate their agreements and take away a concession and the equipment invested in it.

Penalizing success.—A bargain favorable to exploration and initial development may seem unreasonable or unfair to a later government when resources are paying off. To the investor a "fair" return on many long-shot failures requires a full return on the one that "hits." The country, however, sees only a resource proved and developed, sometimes beyond wildest expecations, and may demand a renegotiation of the concession on far less favorable terms than an earlier one.

OVERCOMING INVESTMENT RISKS

To reduce risks to private investment abroad, the United States is now negotiating special treaties with a large number of countries aimed at securing treatment of United States investors no less favorable than that accorded to the nationals of the resource country or of other countries. Typical provisions are: Assurance of freedom to operate, control, and manage enterprises; assurance of prompt, adequate, and effective compensation in event of expropriation; assurances regarding withdrawal of earnings and reasonable amounts of capital invested; and assurances against discriminatory taxation. Disputes arising in areas covered by the treaties are submitted to the International Court of Justice. Treaties are not a guaranty against all the risks which surround American capital abroad, but they do tend to lessen these risks. More often than not these risks are more than counterbalanced by the high-grade mineral reserves involved and the opportunity for profit.

To continue to make a fair return on investments abroad, private firms cannot disregard the interests of the source country. The problem is to reconcile countries' social and economic aspirations with investors' interest in earnings and security of capital.

This requires considerable statesmanship on the part of the companies involved—a new type of statesmanship almost as important as statesmanship at the political level. It might be called economic statesmanship.

American oil companies have been in the fore in economic statesmanship. In the case of Venezuelan oil, for example, absentee control—a most disagreeable situation to countries yearning for full status in the community of nations—has been minimized by using local administrative personnel, local engineers, and local professional and technical services as much as possible.

A second move by investors to improve relations with governments is by offering the stock in the company to the citizens of the source country. A number of other arrangements, aimed at placing more ownership in the hands of the source country, have been adopted or are being considered. One of these is a plan whereby the company turns over to the government a large percent of the shares in the company after full returns on the original investment have been made. Another is a plan whereby the concession agreement terminates at the end of a period of years, after which the investor may continue to operate on a management-contract basis no less favorable to the source country than that offered by alternate bidders.

Our raw materials needs, already growing, have been greatly expanded as a direct result of (1) our decision to strengthen our Armed Forces and the industrial capacity to support them, and (2) the tremendous ad ances of technology which demand a number of raw materials not available in the United States. The size and nature of our mobilization program—"limited" though it is—means that we need more materials, and different kinds of scarce materials. Many of the most vital ones must be imported.

The situation as a whole has given rise to the emergency measures for the conservation and allocation of critical materials for which the Defense Production Administration is responsible, and to the national stockpile program.

This study has been prepared from many sources in order to provide, in as brief and simple a form as possible, a statement of the great raw materials needs which our defense entails and the growing interdependency of the nations of the free world in this important field. It is in two parts. Part I deals with the background, our defense needs, and the problems of investing abroad to expand our resources supply. Part II examines the sources, the supply situation, and the industrial uses of 27 strategic raw materials which must be imported to meet our requirements.

Parts of the material (e. g., certain statistical relationships in the table in part II) have not, so far as is known, been previously published in this form. A short bibliography appears at the end of part II.

WHERE WE STAND ON 27 STRATEGIC IMPORTS

The Nation's huge consumption of copper, lead, rubber, and steel is obvious to everyone. We use these materials in various forms daily, can usually distinguish them one from another, and their names are in common usage.

Far less apparent is the importance of such materials as antimony, cobalt, manganese, columbium, and 30 or 40 other materials whose identity is lost in the industrial process. But without these materials our industrial economy would collapse.

Without tungsten, for example, there could be no low-cost, high-speed tools which we use to fashion just about every item made of metal. Without manganese, the quality of steel would deteriorate into uselessness for many of its common uses. The plastics industry would be far less successful without the hydrofluoric acid which is made from fluorspar.

Alloyed with the steel, copper, and aluminum in the automobiles we operate are a dozen or so other metals needed to give the various components their strength, heat resistance, toughness, and other essential requirements.

The following section is devoted to 27 key materials which we must import, the sources of these materials, their characteristics and uses, and the present supplies available to American industry. The percent dependency shown for each material simply means the percentage of our total consumption that we find necessary to import, and is based upon imports and consumption in 1950.

It should be pointed out that at the present time more than half of the materials listed in the following section, and in the concluding table, are not in short or critical supply. What this section does illustrate is that the effect on our industrial economy, were we to be cut off from our sources of supply, would be serious and far reaching.

Antimony—75-percent dependency

Source countries: Bolivia, Mexico, and the Union of South Africa are the chief sources of ore and concentrates. Mexico supplies the largest amounts of metals, and England the largest amounts of antimony oxides.

Uses: Antimony is used to harden lead used in storage-battery plates, and cable sheathing; antimony oxide is used to flameproof textiles, to manufacture flame-resistant paints, and in ceramic enamels. Antimony is used in considerable quantities to give hardness to metal bearings.

Supplies: The supply of antimony is considered ample to meet all requirements.

Asbestos—95-percent dependency

Source countries: Canada supplies the overwhelming bulk of total imports, but the Union of South Africa, southern Rhodesia and Bolivia supply most of the strategic types.

Uses: Asbestos is used in large quantities as an insulating material: It is essential in the manufacture of fire-resistant textiles, of gaskets and pipe coverings, and of clutches and brake bands.

Supply: Asbestos (amosite) used for special types of thermal insulation is in very short supply. Asbestos which is used in the production of gas-mask filters (crocidolite) is reserved entirely for the military. Grades of asbestos which can be woven into yarns (chrysotile) are not sufficient to meet all demands. The supply of low-iron Rhodesian chrysotile, essential for electric cable covering, is inadequate at the present time.

Bauxite—65-percent dependency

Source countries: Principal imports of bauxite (the ore of aluminum) are from Dutch Guiana, British Guiana, and Indonesia.

Uses: The overwhelming bulk of bauxite is consumed by the aluminum industry, but it also has minor uses in the chemical, refractory, and oil-refining industries and as an abrasive.

Supply: The supplies of bauxite are adequate.

Beryl—90-percent dependency

Source countries: South Africa, Brazil, and southern Rhodesia supply most of our imports of beryl.

Uses: Beryl is the ore of beryllium. The largest use of beryllium is a copper alloy. These alloys have widespread usage, with high-quality electrical springs taking the largest share. Beryllium is also an atomic-energy material.

Supply: Beryllium is in very tight supply.

Bismuth—50–55-percent dependency

Source countries: Peru, Mexico, Canada, and Yugoslavia are the chief suppliers. A large portion of bismuth production results as a byproduce of lead production.

Uses: Bismuth alloys melt at low temperature and therefore are used for electric fuses, safety plugs in water-sprinkling systems, and in other devices for protection against fire and explosion. Bismuth has many time-saving applications in the aircraft, machine-tool, and automotive industries. About 35 percent of bismuth goes into pharmaceuticals, mainly as stomach remedies and cosmetics.

Supply: The supply of bismuth is adequate.

Chromite—99-percent dependency

Source countries: South Africa, Turkey, the Philippines, and southern Rhodesia are the principal sources for chromite. Cuba and New Caledonia also export chromium ores to the United States.

Uses: About 50 percent of all chromite is converted to ferrochrome, in which form most of the chromium is introduced in steel. Chromium is used in stainless steels, high-speed steels, and other tool and engineering steels. Chrome in steel makes it resistant to corrosion and to high temperatures, and imparts high tensile strength. Chrome is used in the manufacture of numerous chemicals and in the manufacture of brick in refractories (industrial furnaces).

Supply: The requirements for chromium ores exceed the supply.

Cobalt—90-percent dependency

Source countries: By far the largest percentage of imports comes from the Belgian Congo, where cobalt is produced as a byproduct of copper operations. Northern Rhodesia, French Morocco, and Canada are also production sources. Several other countries, including Brazil, New Caledonia, and Uganda, contain cobalt-bearing deposits as yet undeveloped.

Uses: Cobalt alloys, because of high-temperature resistance, are essential for components in jet aircraft production. Cobalt is a hard, tough, malleable metal. It is widely used for magnets, and in other electrical equipment.

Supply: The requirements for cobalt greatly exceed the supply. As copper production is expanded, cobalt, as a byproduct of copper production, will be expanded also.

Columbium—100-percent dependency

Source countries: 95 percent of the world's production is from Nigeria, much of it a byproduct of tin mining. Belgian Congo and Brazil are minor sources.

Uses: High-temperature columbium alloys are used in jet engines, gas turbines, rockets, and similar devices. Columbium imparts superior creep resistance and fatigue strength to alloys.

Supply: The supply of columbium is scarcer than that of any of the alloying metals. The outlook for new high-grade sources of the metal is not favorable.

Copper—35-percent dependency

Source countries: Chile is the principal source of copper, but Mexico and Canada also ship substantial amounts to the United States.

Uses: Copper has extremely broad usage—in electrical equipment, automobiles, construction, ammunition, appliances, and many other products. Aluminum can be substituted for copper to a minor extent in some electrical uses, such as long-distance transmission lines, electrical equipment, and motor windings.

Supply: The supply of copper relative to the demand is inadequate and promises to be inadequate for several years to come. Along with steel and aluminum, it is one of the "yardstick" materials used to set the levels of defense and civilian production under the controlled materials plan.

Fluorspar—35-percent dependency

Source countries: Canada, Germany, Mexico, and Spain are our chief foreign suppliers. We also receive imports from Italy and Africa.

Uses: The growing demand for aluminum, plastics, ceramics, and steel has greatly increased the demand for fluorspar. Fluorspar is needed in steel production to promote smelting and to form a fluid slag that carries off impurities. The glass industry uses fluorspar in the preparation of opaque and colored glass. In the enamel industry fluorspar is used to make dense opaque white or colored enamels. Fluorspar is used in the manufacture of hydrofluoric acid, which in turn is widely used in the aluminum and plastics industries.

Supplies: At present there is no serious supply problem with any of the three grades of this material.

Ilmenite—32-percent dependency

Source countries: India supplies the bulk of our imports, with Norway a very poor second.

Uses: Ilmenite, as the principal ore of titanium, promises to be a very important resource as commercial production of the metal increases. The manufacture of titanium pigments accounts for 99 percent of all ilmenite consumption. Small amounts are used in alloys, welding-rod coatings and ceramics.

Supply: The supply of ilmenite at present is sufficient to meet all demands.

Industrial diamonds—100-percent dependency

Source countries: About 70 percent of all industrial diamonds produced in the free world come from the Belgian Congo. French West Africa, the Gold Coast, and other regions of Africa produce much of the remainder. Outside Africa, the most significant producers are Brazil and British Guiana.

Uses: Industrial diamonds are essential in certain grinding wheels. Because of the unmatched hardness of diamonds, they are used to tip many drilling tools, and in dies used for the drawing of fine wire. Diamonds are widely used by the oil industry in drilling operations.

Supply: The available supply of industrial diamonds just about meets requirements—but little can be made available for the stockpile. A new electrolytic grinding method is now undergoing tests and it is possible that this new process may relieve the critical supply situation in the future.

Iron ore 8-percent dependency

Source countries: Chile is the largest supplier with 31 percent of the total, followed closely by Sweden with 25 percent. Canada supplies 22 percent, Brazil 8 percent, and Algeria 6 percent of our iron ore imports.

Uses: Iron ore is perhaps the single most important industrial resource. It is the basic ingredient in the production of steel.

Supplies: There are ample supplies of iron ore available. The iron ore supply pattern is scheduled for major changes in the near future, as important new sources in Canada, Venezuela, and Liberia are developed by United States consumers.

Jewel bearings—90 percent dependency

Source country: Switzerland supplies about 99 percent of our imports of jewel bearings.

Uses: Most of the bearings are used in timepieces, but a large portion goes into precision gages and tools. Jewel bearings are indispensable to the production of numerous types of military equipment—aircraft clocks, fire-control watches, aircraft instruments, etc.

Supply: The supply is adequate to meet present needs.

Lead—45 percent dependency

Source countries: Mexico, Canada, Peru, and Yugoslavia supply the greatest amounts, although the United States receives lead in various forms from a dozen or so other countries as well.

Uses: Lead has a wide range of uses—in storage batteries, paints, gasoline, cable covering, solder, bearings, and many others. A much larger percentage of lead is recovered as scrap than is the case with most other metals.

Supply: There is now a sufficiently large supply of lead to meet the demand.

Manganese—90 percent dependency

Source countries: India is our chief source for manganese ore (over one-third), but we also receive manganese from the Gold Coast, Cuba, the Union of South Africa, French Morocco, Mexico, and elsewhere.

Uses: Manganese is essential in steel production, and requirements rise in direct proportion to the rise in steel production. Manganese acts as a purifier in the making of steel, and it improves the steel's behavior in the rolling mill. It adds strength and toughness to the finished product. Normally, about 90 percent of United States manganese consumption is by the steel industry. Special grades of manganese ore are esential to the production of dry batteries as well as the production of some strategic chemicals.

Supply: The supply of manganese is adequate for most requirements.

Mercury—90 percent dependency

Source countries: Principal suppliers are Spain, Italy, Yugoslavia, and Mexico.

Uses: About 25 percent of all mercury consumed in the United States goes into electrical apparatus. Another 25 percent goes into special instruments and in pharmaceuticals. Substantial quantities are used in the manufacture of antifouling paints, caustic soda, and chlorine.

Supplies: Supplies of mercury are adequate.

Mica—95 percent dependency

Source countries: India and Brazil are the major suppliers of muscovite mica, block film, and splittings. Madagascar and Canada are the major sources of phlogopite mica.

Uses: Muscovite block and film mica is required for electronic tubes, mica capacitors, magnetos, and numerous other uses. Electronic tubes and capacitors are used in enormous and growing quantities in a host of military and civilian products. Muscovite and phlogopite splittings are used for built-up mica electrical insulation.

Supply: The supply of better quality mica barely meets demand.

Nickel—99 percent dependency

Source countries: Four-fifths of the free world's nickel comes from the Sadbury Basin in Canada. Canada supplies about 95 percent of the nickel we import.

Uses: Nickel is used almost exclusively as an alloy with about 45 percent being used in steel. It is essential for the production of stainless steel, which in turn has many uses. Alloyed with steel and other metals, it imparts resistance to corrosion. It is used in alloys where high temperature or electrical resistance is desirable. The metal has a variety of electrical uses—in appliances, magnets, and radio equipment.

Supply: The supply of nickel is critical, and is insufficient to meet fully our total defense demands.

Platinum group—90 percent dependency

Source countries: Platinum-group metals (platinum, palladium, iridium, osmium, rhodium, ruthenium) are imported principally from Canada, Colombia, and South Africa.

Uses: Metals in this group are used in the chemical and electrical industries, and for dental and medical purposes.

Supplies: The supplies and demands for these metals are about in balance.

Quartz crystals—100 percent dependency

Source country: Brazil produces 99 percent of the world output.

Uses: Quartz crystals are used in electronic communications equipment and in certain optical equipment. There is no known satisfactory substitute for quartz in radio transmitter sets, where it is essential to obtaining a stable, controlled frequency.

Supply: The supply of quartz is adequate. Rapid strides have been made by industrial laboratories in recent years in the development of synthetic quartz crystals.

Natural rubber—100 percent dependency

Source countries: Malaya, Indonesia, and Thailand are the three big sources of natural rubber.

Uses: Rubber is put to innumerable uses, and is familiar in a variety of consumer end items. The largest user of rubber is the automobile industry.

Supplies: The supplies of natural rubber have improved considerably with the rising production of synthetic rubber in this country.

Rutile—31 percent dependency

Source country: Australia supplies all rutile imports.

Uses: Rutile is used in the manufacture of welding-rod coatings, fiber glass, chemicals, and in ceramics as a coloring agent. But rutile, along with ilmenite, holds a potentially important future as the ore of titanium metal. Since 1948 there has been widespread interest and research in titanium production. Titanium is an exciting prospective addition to the group of light metals used commercially. It possesses an unusual combination of desirable characteristics—light weight, strength, toughness, and high resistance to corrosion.

Supply: Supply and demand are approximately in balance.

Selenium (elemental)—34 percent dependency

Source country: Almost all of our imports come from Canada.

Uses: Selenium is used principally in the glass, rubber, pigment, and electronics industry.

Supply: The demand and supply are approximately in balance.

Tin—100 percent dependency

Source countries: The free world depends upon southeast Asia for over 60 percent of its newly mined tin. Malaya, Indonesia, and Bolivia are the big three of tin production, although the metal is also mined in the Belgian Congo, Thailand, and Nigeria.

Uses: Tin is used in a wide range of industrial applications because of its excellent corrosion resistance, low melting point, softness, and its ability to adhere as a thin, protective coating on steel. It is used as an alloy in lead, copper, and other metals. More than four-fifths of total consumption is for three major uses—tinplate, solder, and brass and bronze.

Supply: The demand and supply are in balance.

Tungsten—52 percent dependency

Source countries: Major imports of the metal are received from Bolivia, Portugal, Spain, and Brazil. Thailand, Malaya, Burma, Korea, Australia, and several others are also producers. In the years preceding 1950, China was our major source of tungsten. Canadian production is expected to reach important levels in the near future.

Uses: The high melting point of tungsten—higher than any other known metal—and its high specific gravity make tungsten, when alloyed with steel, very valuable in high-speed cutting tools. Tungsten, because of its high temperature resistance, is used in the manufacture of jet engines and wherever weight and hardness are required.

Supply: The supply of tungsten exceeds the present demand. This will permit large shipments to the stockpile.

Zinc—35 percent dependency

Source countries: Canada and Mexico are our principal foreign suppliers; Peru, Bolivia, Spain, and others also export zinc to the United States.

Uses: Zinc is used primarily in galvanizing. Numerous parts of appliances, automobiles, and small utensils are die cast from zinc-base alloys. Zinc is also used in pigments, and as one of the major elements in brass.

Supplies: The supply of zinc is adequate to meet both stockpile and industrial requirements.

SOURCES OF 27 STRATEGIC MATERIALS

The following table shows the source countries of 27 of our most important raw material imports, the percent of the total free world output of each of these materials produced by each major resource country, and the percent of our total imports of each material which each resource country supplies.

The table shows that the United States, in spite of its huge imports of raw materials, is nevertheless the free world's largest raw material producer. Canada, Mexico, the Union of South Africa, Brazil, and the Belgian Congo are shown to be among our largest foreign suppliers of raw materials.

NOTE.—The figures in this table are either taken directly from Bureau of Mines compilations, or are based on information furnished by the Bureau of Mines. An exception: Figures dealing with natural rubber production and imports, which were furnished by the General Services Administration.

It should be pointed out that most figures pertaining to metal and mineral production, imports, and consumption which are used by various Government agencies, by industry, and by the public, generally originate with the Bureau of Mines. A complexity of factors are involved in the compilation of these figures. For example, much of the bismuth shipped into this country from Mexico is contained as an alloy in lead, making it extremely difficult to determine the exact amount of bismuth imported from Mexico. So it is with other imported alloyed metals; and with ores containing more than one metal. Another difficulty is that of tracing a metal or an ore to the source country in cases where they are not shipped directly from the producing to the consuming country. For example, in 1950 we imported about 5 percent of our nickel requirements from Norway—but much of the nickel ores used by the Norwegian smelters originated in Canada. In addition, many figures pertaining to free world production of a given metal or mineral must necessarily be estimates, since many countries do not publish production figures.

Resource countries of the free world, and United States dependency on their production

Country and material	1950 production	Percent of free world output (including United States)	Shipments to United States as a percent of total United States imports
Australia:			
Rutile	18,379 metric tons	73	100
Lead	222,400 metric tons	15	7
Zinc	196,400 metric tons	10	1—
Tungsten (60 percent WO_3)	1,235 metric tons	6.5	6
Belgian Congo:			
Industrial diamonds	9,600,000 metric carats	70	90+
Cobalt	5,148 metric tons	73	99
Tin	13,700 long tons	8	3
Copper	176,000 metric tons	8	0
Zinc	76,000 metric tons	4	0
Tungsten (60 percent WO_3)	164 metric tons	1—	5
Bolivia:			
Antimony	10,300 metric tons	15	39
Tin	31,200 long tons	19	3
Tungsten (60 percent WO_3)	2,500 metric tons	16	16
Lead	13,200 metric tons	2	2.5
Brazil:			
Iron ore	1,900,000 metric tons	.5	8
Tungsten (60 percent WO_3)	759 metric tons	4	9
Mica (sheet)	1,360 metric tons	6	6.5
Quartz crystals	(2)	99	99
Manganese	148,300 metric tons	4	6.5
Beryl	2,893 short tons	40	60
British Guiana: Bauxite	1,609,000 metric tons	23	3.7
Canada:			
Platinum group	269,500 troy ounces	57	46
Nickel	112,181 metric tons	93	95
Copper	237,600 metric tons	10	12
Lead	154,100 metric tons	10	22.5
Zinc	283,600 metric tons	15	43
Asbestos	794,000 metric tons	79	96
Iron ore	3,300,000 metric tons	1.5	22.6
Fluorspar	59,107 metric tons	9	9
Bismuth	101,150 metric tons	7	21
Selenium	261,973 metric tons	(2)	94
Chile:			
Copper	363,000 metric tons	16	42
Iron ore	3,000,000 metric tons	1	31
Colombia: Platinum group	26,400 troy ounces	5.5	8.5
Cuba:			
Chromite	65,820 metric tons	4	8
Manganese	79,000 metric tons	2	5
Dutch Guiana: Bauxite	2,081,000 metric tons	29	78
French Morocco:			
Manganese	287,000 metric tons	8	1.6
Cobalt	420 metric tons	6	0
Beryl	56 short tons	.8	1.3
Gold Coast: Manganese	722,800 metric tons	21	20
India:			
Mica (sheet)	15,874 metric tons	67	85
Manganese	916,080 metric tons	25	34
Ilmenite	216,076 metric tons	27	87
Indonesia:			
Tin	32,000 long tons	20	6
Rubber	698,000 metric tons	37	27
Bauxite	531,000 metric tons	7	18
Italy:			
Zinc	85,348 metric tons	4	0
Mercury	53,346 76-pound flasks	40	30
Japan:			
Copper	39,300 metric tons	2	8
Tungsten (60 percent WO_3)	64 metric tons	—1	5
Malaya:			
Tin	57,500 long tons	35	50
Rubber	628,000 long tons	37	45
Mexico:			
Bismuth	263,000 metric tons	17	23
Copper	61,700 metric tons	3	9
Lead	238,000 metric tons	16	43
Zinc	223, 500 metric tons	11	41
Antimony	5,900 metric tons	14	31
Mercury	3,713 76-pound flasks	4	6.6
Fluorspar	65, 667 metric tons	10	44

Resource countries of the free world, and United States dependency on their production—Continued

Country and material	1950 production	Percent of free world output (including United States)	Shipments to United States as a percent of total United States imports
New Caledonia:			
Nickel	6,300 metric tons	5	0
Chromite	84,801 metric tons	5	5
Nigeria:			
Tin	8,300 long tons	5	0
Columbium	878 metric tons	80	74
Northern Rhodesia:			
Copper	297,000 metric tons	13	13
Cobalt	670 metric tons	9	0
Norway: Ilmenite	105,000 metric tons	13	13
Peru:			
Lead	57,300 metric tons	4	9
Zinc	74,000 metric tons	4	4
Bismuth	250,000 metric tons	16	46
Copper	29,930 metric tons	1.5	4
Tungsten (60 percent WO_3)	516 metric tons	3	6.6
Philippines:			
Chromite	250,511 metric tons	14	16
Copper	10,400 metric tons	1	1.5
Portugal:			
Tungsten (60 percent WO_3)	2,500 metric tons	15	1
Beryl	49 short tons	.7	.6
Southern Rhodesia:			
Chromite	291,525 metric tons	16	13
Beryl	932 short tons	12.7	19.2
Asbestos	64,900 metric tons	5	1.8
Spain:			
Fluorspar	32,669 metric tons	15	2
Mercury	50,000 76-lb. flasks	37	48
Tungsten (60 percent WO_3)	850 metric tons	5	1
Zinc	64,000 metric tons	3	4
Sweden: Iron ore	13,927,000 metric tons	7	24
Switzerland: Jewel bearings	[2]	95	99
Thailand:			
Tin	10,364 long tons	6	2
Rubber	112,200 long tons	6	13
Tungsten (60 percent WO_3)	1,200 metric tons	6	11
Turkey: Chromite	420,792 metric tons	23	20
Union of South Africa:			
Asbestos	79,300 metric tons	7	1.6
Manganese	791,000 metric tons	24	24
Chromite	496,324 metric tons	28	29
Beryl	844 short tons	13	30
Platinum group	150,600 troy ounces	32	6
Antimony	8,300 metric tons	20	0
Industrial diamonds	1,500,000 metric carats	10	12
United States:[1]			
Antimony	4,000 metric tons	10	----
Asbestos	38,495 metric tons	3.5	----
Bauxite	1,356,000 metric tons	19	----
Beryl	559 short tons	7.5	----
Bismuth	7,649 metric tons	1—	----
Chromite	367 metric tons	0	----
Cobalt	299 metric tons	4	----
Copper	824,938 metric tons	36	----
Fluorspar	273,524 metric tons	43	----
Ilmenite	424,851 metric tons	54	----
Iron-ore	99,600,000 metric tons	46	----
Lead	389,974 metric tons	30	----
Manganese	121,974 metric tons	4—	----
Mercury	4,535 76 lb. flasks	4	----
Mica	262 metric tons	1	----
Nickel	828 metric tons	1—	----
Platinum group	37,855 troy ounces	8	----
Rutile	6,836 metric tons	27	----
Selenium	511,325 pounds	[2]	----
Tungsten (60 percent WO_3)	4,373 metric tons	25	----
Zinc	565,513 metric tons	30	----
Yugoslavia:			
Antimony	3,000 metric tons	6	5.5
Lead	[2]	[2]	8.5
Mercury	[2]	[2]	10
Bismuth	[2]	[2]	8
Chromite	115,200 metric tons	6	.8

[1] The United States produced no significant amounts of tin, quartz crystals, jewel bearings, industrial diamonds, and columbium in 1950. There was no commercial production of natural rubber.
[2] Not available.

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NOTE.—This two-part study was originally published by the Defense Production Administration. The text of part II has been amended to reflect the improved supply situation with regard to tin, manganese, and selenium.

[Department of State Bulletin, July 14, 1952]

A MATERIALS POLICY FOR THE UNITED STATES

REPORT OF THE PRESIDENT'S INTERNATIONAL MATERIALS POLICY COMMISSION

On June 23 there was released volume I of a report by the President's International Materials Policy Commission entitled "Resources for Freedom." The 178-page volume, Foundations for Growth and Security, will be followed by four others: The Outlook for Key Commodities (210 pages), The Outlook for Energy Sources (43 pages), The Promise of Technology (228 pages), and Selected Reports to the Commission (154 pages). Following are the text of a letter, released June 23, from the President to William S. Paley, chairman of the Commission; a statement by the President on actions taken to continue the Commission's work; a letter from the President to congressional leaders; and excerpts from a digest of volume I prepared by the Commission.

THE PRESIDENT TO CHAIRMAN PALEY

DEAR MR. PALEY: Your Commission's report is a landmark in its field. I do not believe there has ever been attempted before such a broad and far-sighted appraisal of the material needs and resources of the United States in relation to the needs and resources of the whole free world. Nor, in my judgment, has the conclusion ever been so forcefully stated and documented that international cooperation in resource development and international trade in raw materials is imperative to world peace and prosperity.

Your report likewise makes clear exactly where and how we need to conserve and strengthen our natural resources here at home, and to maintain our dynamic progress in science and technology. The conviction you have expressed that this Nation, despite its serious materials problem, can continue to raise its living standards and strengthen its security in partnership with other freedom-loving nations should be heartening to people everywhere.

I have not yet had an opportunity to study in detail each of your specific recommendations but I am sure they merit careful consideration, not only by the Congress and the executive branch of the Federal Government, but by State governments, the general public and especially by farm, labor, industry, and other private groups most closely related to the problem. It is my hope that your report will stimulate further study and discussion, both in and out of Government, of all aspects of this vital problem.

I extend to your Commission and its staff my thanks and congratulations for the public service you have rendered. Your study, I feel sure, will be appreciated not only in our own country but by people of other nations with which the United States is cooperating toward the preservation of freedom and peace, and the enrichment of human life.

Sincerely yours,

HARRY S. TRUMAN.

STATEMENT OF THE PRESIDENT

(White House press release dated July 1)

I have today taken a number of actions to implement the report of the President's Materials Policy Commission, entitled "Resources for Freedom," which was submitted to me a week ago.

This report tells the story of the needs and resources of this Nation and the nations of the free world extremely well. The document should serve for years to come as a basic guide in providing adequate supplies of the materials we and other friendly nations of the world must have if we are to expand our economy and at the same time remain secure from threats of aggression.

The Commission has done a very constructive job, and I propose to do all that I can to see to it that the Federal Government acts promptly and effectively in continuing the excellent work which the Commission has initiated. To this end I have today taken the following actions:

1. I am transmitting the Commission's report to the Congress. I am not at this time asking for action on specific recommendations, but rather I am calling the entire document to the attention of the Congress in the hope that it will be studied by each Member and by the appropriate committees of the Congress.

2. I am directing the National Security Resources Board to undertake a continuing review of the entire materials situation, as recommended in the Commission's report. The National Security Resources Board will, of course, need adequate funds if this activity is to be carried out effectively and I hope the Congress will provide needed appropriations for this vital project.

3. I am also asking the National Security Resources Board to organize a special task force recruited from various Government agencies to study the detailed recommendations of the Commission and to give me, within no more than 60 days, suggestions for carrying them out.

4. I am asking the heads of departments and agencies concerned with the materials problem to study the report and to advise me through the National Security Resources Board, within no more than 60 days, what steps they believe are appropriate in implementing these recommendations as they pertain to their respective agencies.

5. I am directing the Bureau of the Budget to make a comprehensive review, from an organizational standpoint, of the operations of the executive branch with respect to the materials problem, and to advise me of its findings within no more than 60 days.

The Government, of course, can only do a part of the job. Much of it will have to be done by private industry. Labor organizations, farm groups, and other private bodies can help work out solutions. The universities and private foundations can make a very significant contribution. It is my hope that both public and private groups will join together in the vital task of making certain that in the years to come through wise use of their resources the United States and the nations of the free world will enjoy continued growth and security.

LETTER TO CONGRESSIONAL LEADERS [1]

The President on July 1 sent the following letter to Alben W. Barkley, President of the Senate, and Sam Rayburn, Speaker of the House of Representatives.

I am transmitting to the Congress the report of the President's Materials Policy Commission, Resources for Freedom. Our knowledge and understanding of the materials position of the United States and of its allies throughout the free world will be considerably increased by the detailed review which has been prepared by the Commission. This is a document which deserves the most careful study by every member of the Congress, and I hope each one of them will take the time to familiarize himself with its contents.

This report, the fruit of months of intensive study by an independent citizens' group aided by experts drawn from Government, industry, and universities, shows that in the past decade the United States has changed from a net exporter to a net importer of materials, and projects an increasing dependence on imports for the future. The report indicates that our altered materials situation does not call for alarm but does call for adjustments in public policy and private activity.

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[1] H. Doc. 527.

In more than 70 specific recommendations, the Commission points out the actions which, in its judgment, will best assure the mounting supplies of materials and energy which our economic progress and security will require in the next quarter century.

I am requesting the various Government agencies to make a detailed study of these recommendations, and I am directing the National Security Resources Board to assume the responsibility of coordinating the findings and of maintaining a continuing review of materials policies and programs as a guide to public policy and private endeavor. As the need arises for legislation to solve materials problems affecting this Nation and other free nations, appropriate recommendations will be made to the Congress.

It is my hope that this report and the actions which may be taken as a result of it will contribute significantly to the improvement of this Nation's materials position and to the strengthening of the free world's economic security, both of which are the continuing objectives of United States policy.

Sincerely yours,

HARRY S. TRUMAN.

DIGEST OF VOLUME I

[Excerpts]

There is a materials problem of considerable severity affecting the United States and the industrialized nations of Western Europe. Unless the problem is effectively met, the long-range security and economic growth of this and other free nations will be seriously impaired. The Commission's report is primarily concerned with the United States problem, which cannot, however, be isolated from the rest of the free world problem.

The basic reason for the problem is soaring demand. This country took out of the ground 2½ times more bitumnious coal in 1950 than in 1900; 3 times more copper, 4 times more zinc, 30 times more crude oil. The quantity of most metals and mineral fuels used in the United States since the First World War exceeds the total used throughout the entire world in all of history preceding 1914. Although almost all materials are in heavily increasing demand, the hard core of the materials problem is minerals.

In 1950, the United States consumed 2.7 billion tons of materials of all kinds—metallic ores, nonmetallic minerals, agricultural materials, construction materials, and fuels—or about 36,000 pounds for every man, woman, and child in the country. With less than 10 percent of free world population, and only 8 percent of its area, the United States consumed more than half of 1950's supply of such fundamental materials as petroleum, rubber, iron ore, manganese, and zinc.

The President's Materials Policy Commission was asked by President Truman to investigate the long-term aspects of the materials problem as distinct from short-range or emergency aspects, and picked as the period for study the quarter century between 1950 and 1975. The Commission's report does not overlook the possibility of war in this period but neither does it assume war. War would alter the patterns of materials demand and supply in swift and drastic ways; yet if permanent peace should prevail, and all the nations of the world should acquire the same standard of living as our own, the resulting world need for materials would be six times present consumption. In considering materials at long range, therefore, we have roughly the same problems to face and actions to pursue, war or no war.

For the last hundred years, the United States total output of all goods and services (the gross national product, or GNP) has increased at the average rate of 3 percent a year, compounded. Such a rate means an approximate doubling every 25 years (which would mean a nineteen-fold increase in a full century). As of 1950, the GNP was approximately $283 billion. In considering the next quarter century the Commission has made no assumption more radical than that the GNP will continue to increase at the same 3-percent rate compounded every year, which is the average of the last century, all booms and depressions included. This would mean a GNP in the middle of the 1970's, of about $566 billion, measured in dollars of 1950 purchasing power. The Commission has also assumed, after consultation with the Bureau of the Census, that population will increase to 193 million by 1975, and the working force to 82 million, compared to the 1950 figures of 151 million and 62 million. It has also assumed a shortening workweek, but that man-hour productivity will continue to rise somewhat more than in the recent past. But even these conservative assumptions bring the

United States up against some very hard problems of maintaining materials supply, for natural resources, whatever else they may be doing, are not expanding at compound rates.

Absolute shortages are not the threat in the materials problem. We need not expect we will some day wake up to discover we have run out of materials and that economic activity has come to an end. The threat of the materials problem lies in insidiously rising costs which can undermine our rising standard of living, impair the dynamic quality of American capitalism, and weaken the economic foundations of national security. These costs are not just dollar costs, but what economists refer to as real costs—meaning the hours of human work and the amounts of capital required to bring a pound of industrial material or a unit of energy into useful form. Over most of the 20th century these real costs of materials have been declining, and this decline has helped our living standards to rise. But there is now reason to suspect that this decline has been slowed, that in some cases it has been stopped, and in others reversed. The central challenge of the materials problem is, therefore, to meet our expanding demands with expanding supplies while averting a rise in real costs per unit.

In materials, there is always a tendency for real costs to rise because invariably people use their richest resources first and turn to the leaner supplies only when they have to. What is of concern today is that the combination of soaring demand and shrinking resources creates a set of upward cost pressures much more difficult to overcome than any in the past. In the United States there are no longer large mineral deposits in the West waiting to be stumbled upon and scooped up with picks and shovels; nor are there any longer vast forest tracts to be discovered. We can always scratch harder and harder for materials, but declining or even lagging productivity in the raw materials industries will rob economic gains made elsewhere. The ailment of rising real costs is all the more serious because it does not give dramatic warning of its onset; it creeps upon its victim so slowly that it is hard to tell when the attack began.

In recent years, the general inflation has struck with special force at many materials, causing their prices to rise more than the price structure as a whole. Some materials prices are high today because demand has temporarily outrun supply; here we can expect the situation to adjust itself. But in other cases the problem is more enduring than this, and reflects a basic change of supply conditions and costs. It would be wishful, for example, to expect lumber prices to settle back to their pre-1940 price relationship; we are running up against a physical limitation in the supply of timber, set by the size and growth rates of our forests, and cost relief through easy expansion is not to be expected. For such metals as copper, lead, and zinc, United States discovery is falling in relation to demand, and prices reflect the increasing pressure against limited resources.

The Commission's report discusses at length the ways and means whereby rising real costs can be halted, and a trend toward lower real costs, such as we enjoyed through most of the first half of the 20th century, reestablished. It recognizes also the problem of having enough materials physically available in the event of war, and considers various ways of assuring materials security. The report emphasizes that "there is no such thing as a purely domestic policy toward materials that all the world must have; there are only word policies that have domestic aspects." The Commission states its conviction that if the United States and other free nations are, in the years ahead,, to enjoy economic growth and national security, "they must coordinate their resources to the ends of common growth, common safety, and common welfare." The Commission states as the major premise of its report that:

"The overall objective of a national materials policy for the United States should be to insure an adequate and dependable flow of materials at the lowest cost consistent with national security and with the welfare of friendly nations."

THREE MAJOR PATHS

In general, the United States has three major paths to follow in working out the problems of high consumption, prudent conserving, and a domestic resource base that is shrinking in comparison with our needs:

(1) We can make new discoveries of needed materials at home, and otherwise increase the usable fraction of our total resource base.

(2) We can alter our patterns of use away from scarce resources and toward more abundant ones.

(3) We can import larger quantities of materials from other nations of the free world on terms advantageous to buyer and seller.

Getting more from imports

If there is to be a 50- to 60-percent increase in our use of materials in the next quarter century, this will mean that our total materials consumption will rise from 2.7 billion tons a year now to around 4 billion tons by 1975. The trend toward greater imports, perhaps amounting to a fifth or a quarter, by value, of what we use, thus seems inescapable. But here, too, we have flexibility. Where import conditions are unattractive we can always raise domestic output, at higher cost, develop substitutes or, if need be, use less. But where conditions for economic cooperation are favorable, it will, in the opinion of the Commission, pay us to import. The resource-rich but relatively undeveloped nations of South America, Africa, South Asia, and the Middle East will also profit, for by exporting to us they can obtain the dollar exchange with which to acquire more of the capital goods they need to assist their own economic growth. Such an interchange can take place between the industrial and resource nations, the report states, "to the tremendous advantage of each." The Commission rejects completely the concept of United States self-sufficiency as amounting to nothing more than a self-imposed blockade. The report continues:

"The fact that nature distributed resources very unevenly over the face of the earth in relation to human population and consumption alone argues in favor of increasing integration of the various national economies of the free world. But the hard political facts of mid-20th century add further great weight to the proposition that it will be to the mutual advantage of all freedom-loving peoples of the earth to achieve a greater measure of economic and political cooperation than ever before, founded on the principles of mutual help and respect. Such cooperation can succeed only if it based on a clear understanding of the varying needs and resources of all the nations concerned, and the opportunities which lie in mobilizing the strength of all to meet the particular weaknesses of each."

On paper, the economic opportunities in free world cooperation to produce materials are tremendous; they suggest a possible new era of world advancement dazzling in its promise. Unfortunately a great many problems, mostly man-made, lie in the path. Less developed countries today are highly conscious of the disparity between their own standards of living and those of more highly developed countries. They resent the stigma of colonialism which often attaches to economies heavily dependent on raw-material exports. They remember the great depression of the 1930's when falling prices for their big raw-material exports wiped out their ability to buy the goods they needed from their more industrialized neighbors.

On the other hand, individuals and corporations with capital to invest in foreign raw-materials production hold back for fear of legal uncertainties, fear of expropriation, and the possible impermanence of governments with whom they might make contracts. They fear arbitrary administration of import and export controls and limitations on the convertibility of their earnings into American dollars. At home, tariffs, "Buy American" legislation, and certain aspects of our tax laws add to the obstacles.

It would be folly for policymakers in this or any other nation to assume that the present turmoil of the world will work itself out in ideal fashion. The violent political upheavals of this century clearly have not yet spent their force. What happens internally in the less developed nations, and to their economic and political relations with the industrially advanced nations of the free world, will largely determine whether materials development can be used to help world progress.

Enormous new investment would be needed for foreign resources expansion. Whereas the recent level of private United States investment in mining and smelting development abroad has averaged around $50 million a year, the Commission estimates that $100 million a year will be needed for the next 25 years to fulfill free world needs for copper alone.

The principle of least cost

With the United States economy facing stronger and stronger pressures toward rising real costs of materials, this Commission believes that national materials policy should be founded squarely on the principle of buying at the least cost possible for equivalent values. With growth pressing so heavily against our resource base we cannot afford to legislate against this principle for the benefit of particular producer groups at the expense of our consumers and foreign neighbors, and ultimately with prejudice to our own economic growth and security.

This cardinal principle of least cost has application to all major sectors of national materials policy: to development of domestic resources, to energy and technology, to imports of foreign materials, and to security. Its application is most often challenged, however, with respect to imports and security.

That our economy can best develop by obtaining its material at the lowest possible cost is most often attacked by those whose costs are higher than those of foreign competitors. It is they who ask for restriction of imports on the grounds of "protecting the American standard of living from the competition of lower paid foreign labor." This argument is often buttressed with the assertion that we should strive to be as self-sufficient as possible in view of the security risks we face.

The Commission feels strongly that this line of argument is fallacious and dangerous. The idea that the American standard of living must be protected from low-cost foreign supplies based upon cheap labor is an idea based on unemployment psychology. In a full employment situation the supply of any material from abroad at a price below that of our domestic costs, provided it does not represent a temporary dumping, does not lower the standard of living but actually helps push it higher. In the United States it enables us to use manpower and equipment to better advantage in making something that is worth more than the cheaper material that can be obtained from abroad. Abroad, our purchases will contribute to a strengthening of economic life and improvement of working conditions in the nations from whom we import.

It is true that where our domestic industries face a considerable reduction in output, with employees and capital unable to transfer quickly to more remunerative activities, the Government has the responsibility of easing the transition to the new situation. This, however, is hardly likely to be an important problem in the materials field, where even the declining industries are more likely to be faced with a shortage of manpower than with a surplus.

THE PROBLEM OF SECURITY

As, in one material after another, we reach the stage at which we must turn abroad for additional supplies, the point may be raised that we are endangering our security by dependence on foreign sources; on "fair weather friends" whose supplies in time of war will not be available to us.

This point is substantial enough for serious consideration. The issue must be defined. It is to gain the greatest security at the lowest cost. Sometimes the least-cost route to security is to give special aid to domestic industry, sometimes it is not; when aid is indicated it is always best to tailor it to the specific situation. Self-sufficiency for many materials is impossible; for many others it is economic nonsense. It is certainly not true that for all materials an unqualified dependence on domestic supplies is the best in the end, even when physically possible. With some materials, peacetime dependence on domestic supplies may mean such depletion that if war comes a reserve which might otherwise have existed will have been destroyed. With some materials it is much more economical to depend upon expanded output in safe areas abroad and on stockpiles built in whole or in part on foreign supplies than to maintain a domestic industry behind elaborate and expensive protection. With some materials it may be advisable to maintain a domestic industry which normally supplies only part of our requirements, but is capable of a rapid expansion. It is far from obvious that because we need a material desperately in wartime, the one best solution is to maintain a high-cost domestic industry in peacetime. That may sometimes be proper, but it is not generally so, and our policy must be to make separate decisions based on examination of the particular merits of each case.

The fallacy of self-sufficiency as a basic guide to a sound materials policy is that its costs too much, in every way. A 50-cent increase per barrel of petroleum or a 2-cent increase in the average price per pound of basic metals would add to our annual bill for these materials about $1 billion and $2.5 billion, respectively. Yet it is not in dollars alone that the increased costs of self-sufficiency would be paid. Other countries in the free world find markets for their exports in the United States and we, to our profit, are a principal source of industrial products for them. Interferences with these normal channels of trade in the name of self-sufficiency would inevitably check economic growth both at home and abroad. The political consequences of self-sufficiency, with its accompanying damage to carefully established security arrangements, would prove even more serious.

The dimensions of the materials security problem are far broader than the needs of the United States alone, for we have a real concern to see that our allies are likewise well supplied with materials to support their own military strengths. If a war should cut off the flow of oil to Western Europe from the Middle East, the burden of fueling Western Europe would fall heavily upon the oil-producing nations of the Western Hemisphere. The problem then facing the United States of reconciling its own needs with those of its allies would transcend purely domestic considerations. For the United States and the rest of the free world the geography and logistics of a possible war, the greater mechanization of our Armed Forces, the superior care and protection of our manpower, and the higher living standards of our people all put a heavier drain upon our resources than our adversaries are likely to encounter. Hence, to accomplish the same war ends, the free nations would require more materials than would the enemy. To meet or anticipate our needs from the supply side, we stockpile, and we seek reserve materials capacity in safe areas, domestic and foreign. On the supply side, civilian authority remains more or less in control. But on the demand side, the military, particularly in wartime, is in a commanding position. With each successive war, and now with preparation against the contingency of another, the military has become a greater and greater claimant against the material of the whole economy. It would be impossible to fix a maximum percentage of military claims to the total economy and say "beyond this point you may not go." But even though the point cannot be fixed it is known to exist—and to push military consumption beyond it is to collapse the civilian economy and hence, per se, to lose the war. Thus the military carries a heavy responsibility to use materials efficiently and to hold its demands to the lowest limits properly consistent with adequate military strength, both in peacetime and wartime. Progress has been made here in recent years, but there is room, and pressing need, for more.

THE FUNDAMENTAL CONCEPTS

The report sums up the convictions of the Commission as follows:

"First, we share the belief of the American people in the principles of growth. Where there may be any unbreakable upper limits to the continuing growth of our economy we do not pretend to know, but it must be part of the materials task to examine all apparent limits.

"Second, we believe in private enterprise as the most efficacious way of performing industrial tasks in the United States. We believe in a minimum of interference with its patterns, but this does not mean we believe this minimum must be set at zero. Private enterprise itself has often asked for help or restraints from Government; we have thus long experienced a mixture of private and public influences on our economy. The Commission sees no reason either to blink this fact or to decry it, believing that the coexistence of great private and public strength is not only desirable but essential to our preservation.

"Third, we believe that the destinies of the United States and the rest of the free non-Communist world are inextricably bound together. Applied to the materials problem, this belief implies that if the United States is to increase its imports of raw materials—as we believe it must—it must return in other forms strength for strength to match what it receives. If we fail to work for a rise in the standard of living of the rest of the free world, we thereby hamper and impede the further rise of our own, and equally lessen the chances of democracy to prosper and peace to reign the world over."

THE RECOMMENDATIONS OF THE COMMISSION

The Commission made over 70 recommendations to ease the materials problem and to insure as far as possible against the threat of rising real costs. These recommendations appear in full in volume I of the Commission's report.

To stimulate foreign trade and open up new free world material sources—The Commission recommended that:

The United States should negotiate government-to-government agreements with resource countries, designed to encourage and protect the enormous investment necessary to create new materials production abroad. (It was also the Commission's view that United States representatives should encourage a wider use of United Nations technical assistance in geological surveying and minerals exploration in the underdeveloped countries.)

The United States should expand, perhaps to as much as $4 million a year, its own technical assistance along the lines of geological surveys, preliminary ex-

ploration and mining technology advice, with assurances from the resource-countries' governments that they will promote conditions favorable to developing new mineral resources discovered.

When current emergency agencies eventually disband, a permanent agency should be empowered to make long-term purchase contracts, including price guaranties, with resource nations; to make loans for foreign-materials production where special security interests justify assumption of risks beyond those assumable by the Export-Import Bank.

Legislation explicitly authorizing the Government to enter into management contracts for foreign-materials expansion should be enacted by the Congress.

There should be permanent legislation empowering the elimination of duty, apart from reciprocal action by other countries, when United States need for imports of a particular material becomes crucial. (The Commission believes there should also be expansion of authority under the Reciprocal Trade Agreements Act to reduce duties on raw materials in which the United States is deficient.)

The Buy American Act, characterized by the Commission as "a relic of depression psychology," should be repealed.

There should be a continuing study of world materials demand and production, with statistics maintained by the United Nations; special international study groups should be set up when particular difficulties are encountered, similar to those now reviewing wool, rubber, and tin. (For reducing market instability the Commission saw promising possibilities in the multilateral contract, such as the International Wheat Agreement, and in testing international buffer stocks as compensating inventories in a few materials.)

Certain changes in the United States tax laws should be made to spur materials investment by United States citizens in foreign countries as follows: allowing taxpayers to elect annually between per country and overall limitation in claiming credits on their United States tax bill for taxes paid abroad; permitting deferral of reporting income until actually received; extending the privilege of filing consolidated returns with foreign subsidiaries; allowing stockholders in foreign corporations which have invested in exploration and development to treat part of their dividends as a tax-free return of capital rather than as taxable income.

ECONOMICS
of
NATIONAL SECURITY

Managing America's Resources for Defense

BY

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OUR RAW MATERIALS POSITION

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Military security depends heavily on a vigorous and expanding economy to produce the overwhelming quantities of the equipment, machinery, and supplies necessary for modern military strength. On the other hand, healthy economic growth depends importantly on military security to maintain that climate of confidence in the future in which private enterprise flourishes. Neither military nor economic strength can be raised to its highest potential without an abundant and varied flow of materials. (President's Materials Policy Commission, I, 1.)

INTRODUCTION

RAW MATERIALS are the basic products of mine, well, soil, and sea. This chapter discusses our raw materials position from the standpoint of capabilities and requirements. After a short general discussion of the problem, the remainder of the chapter will consist of two parts. The first discusses nonrenewable raw materials, minerals which, once extracted, cannot be replaced. The second part discusses renewable raw materials, the products of farm and forest which are derived from the soil and can be renewed so long as that soil is preserved. The succeeding chapter will discuss ways to assure an adequate supply of raw materials in time of emergency. The energy-producing materials, coal, petroleum, and gas, are discussed in chapter IX.

The Elements of time, distance and mass must be kept in mind

in appraising our raw materials problem. Given time, production of a particular material can usually be expanded, sometimes only at increased unit cost. The time period varies. Twenty-five or more years from decision are needed to produce saw timber. A few months to several years are required for agricultural products. Mineral production can be expanded but slowly, as a general rule, and then only at a rising cost unless coincident with favorable technological improvement. The programs related to minerals expansion, those of substitution and conservation, take time to institute in our complicated economy. Yet, mobilization, limited or total, means an immediate expansion of requirements for materials. Some preparatory measures can be taken through development projects to go into production in an emergency. But these can usually be undertaken only within the United States and will contribute only an increment toward the expanded need in many materials. The only satisfactory expedient to cushion the impact of rising requirements for many scarce materials is a stockpile built in time of peace. (See chapter VIII for extended discussion of stockpiling.)

The factor of distance is important. Supply lines to ourselves and our allies from overseas sources are vulnerable to attack. Hence, scarce military resources, such as naval escort vessels, have to be allocated to assure the uninterrupted flow of raw material resources. The factor of mass coupled with that of distance makes the location of some materials an important element of their utility. The utility of minerals needed in quantity (coal, iron ore, petroleum, bauxite, manganese and sulphur) is very dependent on availability of transportation for huge bulks and weights. Water transportation is by far the cheapest (see chapter X), but, with the possible exception of inland and coastal traffic in the United States, it is vulnerable to attack in war. The effect of distance and mass on supply of one raw material in war is exemplified by the World War II importance of Middle Eastern oil. It is questionable whether the allies could have undertaken the "Hump route" into China or the war in India-Burma and the Eastern Mediterranean if they had not been able to use Middle Eastern oil. There were not enough tankers in the world to accomplish the other necessary tasks and, at the same time, move the oil for these theatres from sources in the Western Hemisphere. As a general principle applying to bulky raw materials as well as to men and munitions in war, "power is local."

The element of cost in terms of manpower and other resources is important. It is possible to grow tomatoes at the North Pole. But a United States or world food supply produced on such a standard of input per meal would mean a very low number of calories per individual per day. Turning to minerals, it is possible to obtain many that are needed from very low grade ores or other costly extraction operations. As an example, the PMPC[1] commented that the 1952 going price of 77 cents a pound for manganese resulted in very little production in the United States. But a price of two dollars a pound would have made it profitable to extract our manganese needs from United States low grade ores – with a consequent rise in the price of steel, which requires 14 pounds of manganese per ton. Put another way, the problem of scarce materials is both a problem of absolute scarcity, in the case of some materials, and a problem of cost. Hence, the problem becomes both a standard of living problem and a national security problem.

The important interdependence of nations. "There is no such thing as a purely domestic policy toward materials that all the world must have; there are only world policies that have domestic aspects."[2] The sources of materials are unevenly distributed about the world in relation to population and to countries. This statement applies to both renewable and non-renewable materials. Hence, international trade in raw materials is an essential to economic development of the world's nations. The necessity for access to foreign raw materials by victor and vanquished was recognized in one of the clauses of the Atlantic Charter:

> ". . . they will endeavor, with due respect for their existing obligations, to further the enjoyment by all States, great or small, victor or vanquished of access on equal terms, to the trade and to the raw materials of the world which are needed for their economic prosperity. . . ."

The foregoing statement might be classified as a pious hope by cynics, but it implies one of the great problems of free-world collective security. While the communist bloc may be, and probably is, approximately self-sufficient, no free world nation is or can be self-sufficient. The political dynamics of collective security now lead

[1] This chapter and the next lean heavily on the President's Materials Policy Commission Report for facts and for support in the analysis and the policy suggestions made. This commission will be referred to as the PMPC.

[2] Loc. cit.

Source: Commodity Studies; PMPC Projection.

Chart VII-1.

toward cooperation and mutual support in the raw materials field as well as in the strategy of raising armed forces and of defense plans. The six-nation Schuman Plan in western Europe and the International Materials Conference instituted during the Korean crisis are examples of increasing cooperation.

Materials, a foundation of military strength. Military production and all manufacturing production depends on industrialization. Industrialization, in turn, depends on an adequate supply of materials in two ways. First, the provision of food and other renewable materials for the entire economic group must be accomplished by only a proportion of that group. Otherwise, there will be no manpower available to work in manufacturing, transportation, and the other economic activities which add up to industrialization. The United States, for instance, produces its renewable materials with

11 to 12 per cent of its labor force. Some other countries require most of their labor force to work in agriculture, in order to maintain a bare subsistence level. The second aspect of dependence on raw materials pertains principally to minerals. The machines of the industrial process are made and operated from minerals. Most of the fabrication of industry is from mineral products. The gear and supplies of defense and of war are increasingly derived from minerals. In the Franco-Prussian war the proportion was perhaps 25 per cent, in World War II perhaps 75 per cent. This surge toward dependence on non-renewable materials fabricated by industry was in considerable part due to replacement of the hay-burning horse by minerals-burning machines. It is also due to the advance of technology which, in creating more efficient weapons of destruction, has made our security dependent on the tripod of (1) materials, particularly minerals, (2) international arrangement guaranteeing adequate materials to ourselves and our allies, and (3) a pattern of industrialization which gives us the manufacturing capabilities to use the materials available.

I: UNITED STATES MINERALS POSITION

The problem. Of the minerals it possesses, the United States is consuming more than it can produce without disproportionate increase in costs. This condition is worsening with rising requirements and decreasing reserves. For all practical purposes, the United States is absolutely lacking in several important minerals and can provide only part of its needs for many others (see chart VII-3). Furthermore, its allies – and the United States, itself – are placing increasingly heavy pressures on existing world supplies.

The intensity of the problem of raw materials, short of war and if war comes, "arises from the convergence of powerful historical forces: First, there has been a profound shift in the basic materials position of the United States – a worsening relationship between our requirements and our means of satisfying them. Second, other high-consuming nations, primarily in western Europe, are in difficulties which stem from the serious depletion of their own domestic resources coupled with the weakening or severing of their former colonial ties. Third, many resource-rich but less-developed nations,

especially of former colonial status, now focus on industrialization rather than materials export. Fourth, there lingers from the Great Depression a world-wide fear of the possible collapse of markets, which dampens the willingness of private investors and resource-rich countries to develop new free-world resource. Finally, a great schism divides the world between the totalitarian and democratic nations, disrupting normal trade patterns and making necessary costly measures of armed preparedness."[3]

The creeping depletion of mineral resources is in acute contrast to obtaining water by pouring it from a pail. A steady stream is assured and can be quickly increased or decreased in volume until the pail is suddenly entirely empty. In contrast, extraction of our flagging minerals supply is more like squeezing water from a soaked cushion. The first efforts return a comparatively large amount of water, succeeding increments of effort get less and less water. The cushion is never squeezed quite dry, but the cost per unit of return goes progressively upward.

MINERAL REQUIREMENTS

Mineral requirements are more a function of technology and industrialization than of population. Put another way, they seem to bear a fairly direct relationship to per capita national income. Historically, requirements have surged upward in World War I and II. (See Chart VII-2.) But they have not decreased for any significant length of time after these wars. The trend has continued upward. The relationship of United States requirements to those of other countries is significant, since other nations have a rising standard of living as a major objective. If every free nation consumed minerals at the same per capita rate as the United States, six times the current free world production of materials would be required. In 1950, the average consumption per United States citizen was about 14,000 pounds of fuel, 800 pounds of metals drawn from 5,000 pounds of ores, 800 pounds of non-metallic minerals (such as lime) drawn principally from the ground, and thousands of pounds of stone, sand, and gravel.

[3] PMPC Report, *Foundations for Growth and Security*, p. 1.

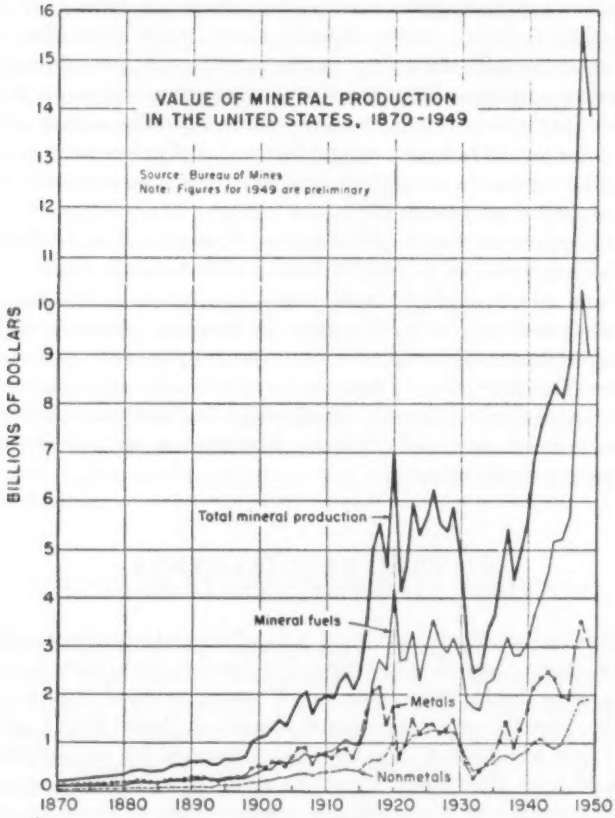


Chart VII-2.

The average American, in 1950, consumed over 18 tons of materials. Pause and consider for a moment the extraction, cultivation, fabrication, processing, transportation, and distribution activities involved – and the effect of a 25 per cent increase (or decrease) in this consumption.

Expanding requirements. The demands for minerals have expanded in two ways. First, the demand for total quantity of each material increased. For instance, in 1950 – as compared to 1900 – we were consuming 2½ times more bituminous coal, 3 times more

copper, 3½ times more iron ore, 4 times more zinc, 26 times more natural gas, and 30 times more crude oil. Second, the number of minerals required continually expands with the advance of technology. In 1900, industry used little more than the few minerals known since antiquity: coal, iron, copper, tin, lead, zinc, gold, and silver. But technological advances have now made some 45 metallic elements and 8000 alloys of these metals essential to modern industry. To cite an example, titanium, once an impurity in iron ore, first became useful as a substitute for lead and then became important in the construction of high-speed jet aircraft. Germanium makes possible the transistor, which performs many of the functions of the vacuum tube. Technology has given flexibility through devising ways to substitute one mineral product for another. The requirements for those minerals which technology has made capable of substitution for each other have become related. Thus, petroleum and coal, aluminum and copper, are related.

Expansion of requirements in the future will be no less rapid than in the past. In considering this expansion we must take account of the requirements of other countries in the free world, for adequate minerals are as important as adequate food to their political and economic stability and military strength. In the case of minerals, unlike most agricultural products, we are in competition with allies for a limited non-renewable supply. Table I gives an estimate of the expanded requirements in the decade of 1970–1980 compared to consumption in 1950, for selected minerals. Note that it is estimated that demand for different minerals will rise unevenly.

The immediately foregoing discussion of requirements raises a logical question as to capabilities for supply, and this is discussed below. But first we should consider the special case of minerals for military purposes.

Military requirements for minerals in mobilization and war have some characteristics which can be usefully summarized in tabular form.

1. They are disproportionately higher than the "take" of war from the national product (note Chart VII-2). Thus, if we estimate at least 50 per cent of gross national product devoted to defense, we can expect a much greater proportion of available minerals to be so devoted.

2. The preparation of a mobilization base of standby production

TABLE 1

INCREASE IN REQUIREMENTS FOR SELECTED MINERALS BY 1970–1980
(in percentage of 1950 consumption)
(and exclusive of scrap)

	United States	*Other free world*
Tin	18	50
Copper	43	54
Zinc	39	61
Iron Ore	54	73
Nickel	100	100
Tungsten	150	150
Fluorspar	187	260
Petroleum	109	275
Aluminum	291	415

Source: Adapted from PMPC Report, *Foundations for Growth and Security*, p. 9.

facilities assures an immediate jump in effective demand for minerals of special war importance. Hence, preparations must be made to have these immediately available. (See stockpiling, chapter VIII.)

3. The special demands of war occasion peak requirements for certain minerals, far above maximum peacetime needs and beyond the capability to supply through restrictions on the civilian economy; for example, columbium for high temperature alloys and germanium for electronics.

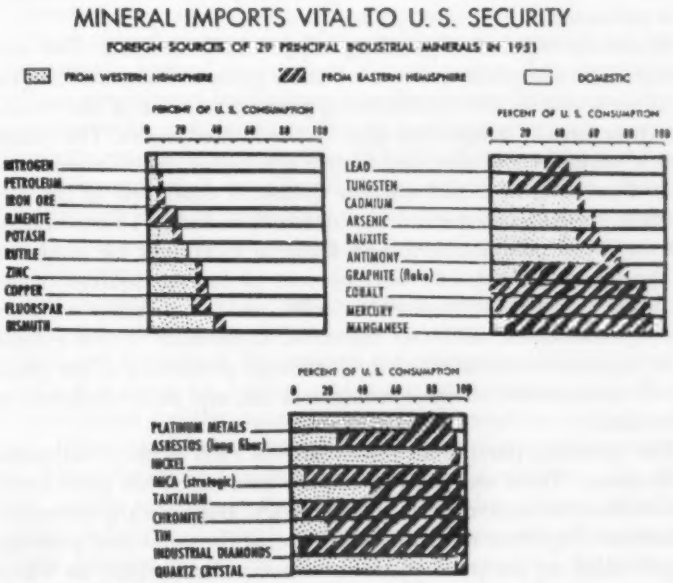
The trend of military requirements for minerals is similar to the long-range peacetime trend discussed in the preceding section. The military standards of the United States and allies stress machines. For example, artillery in Korea used ammunition more than five times as fast as in World War II. Cargo landed per day per man in Korea (which is one measure of materials consumption) was one-third greater than in World War II. The jet plane of the early 1950's used something more than twice as much copper, steel, and aluminum, and probably over twice as much petroleum, as the plane of World War II. Finally the dependence of ourselves and allies on overseas sources means a requirement for cargo shipping in war, for naval vessels to protect the cargo shipping, and perhaps for military forces to protect the areas from which the minerals are extracted. If these areas are in possession of a neutral, allocations of scarce products may be necessary to persuade the neutral to furnish the materials. (See chapter XIX, "Economic Warfare.")

The impact of rising military requirements on our allies is particularly serious. The NATO countries, with much less indigenous materials resources than the United States, are bound to be pressed by new requirements such as the scarce minerals in electronics and the expanded consumption of petroleum in modern aircraft.

It is feasible to compute the supply of minerals required to support a war plan on a time-phased basis. (See Charts II-1 and II-2.) In fact, an essential part of a war plan is an estimate of requirements for basic materials and a program for meeting these requirements.

SUPPLY OF MINERALS

The United States situation. The United States is a net importer today of all metals except two: magnesium and molybdenum. It has become a major importer of two (iron ore and petroleum) out of the three great pillars of industrialization and military strength. The



Source: U.S. Bureau of Mines, PMPC, I, 157.

Chart VII-3.

third is coal. We are the world's largest importers of copper, lead, and zinc, whereas we were once huge exporters. In 1950, we were using up our own known reserves of five important minerals at the rates shown in Chart VII-1.

Our worsening minerals situation is clearly apparent from a study of the strategic and critical materials list of the U.S. Government (Table 1, chapter VIII). It contains about 75 commodities, of which some 50 are minerals. When classified by their different grades, which often have to be obtained from widely scattered sources, the minerals list totals more than 60. In 1940, this same list totalled 15 minerals. Mineral imports are now vital to the United States standard of living and to United States security. The foreign sources, by hemispheres, of 29 principal minerals are shown in Chart VII-3. The reader should observe particularly the extent of dependence on the eastern hemisphere and hence on long exposed communications lines. There is a similar and often greater problem for our allies. In a collective security system raw materials problems become collective problems.

Maintaining and expanding supply in peacetime. The foregoing pages admittedly present a gloomy picture. But something can be done about it, and the following pages give some of the courses of action already adopted or open to the United States. The discussion is summary and intended to give a basis for the examination of special preparedness and wartime measures contained in the next chapter. Broadly categorized the measures include (1) exploration, (2) improved administrative and financial incentives for producers in the minerals field, (3) development of foreign sources by exploration, investment, favorable tariffs, and cooperation with the country concerned, and (4) improved technology which extends from improved exploration methods through processing of low grade ores to reclamation, to more economical use, and to development of substitutes.

The following paragraphs briefly discuss each of these categories of measures. These measures all require time. Each has some application after the beginning of an emergency. But they are essentially peacetime, long-term measures which are, at the same time, essential to providing an adequate platform of economic strength on which to build the special security measures discussed in the next chapter.

Exploration of surface outcroppings in the United States has been

fairly complete. The future of exploration in this country lies in development and improvement of methods for looking beneath the surface of the earth. Considerable undiscovered deposits of valuable minerals may exist. The methods of exploration for minerals such as, iron ore and petroleum, extracted by great corporations, are materially advanced over methods used in searching for other minerals. Research and development of exploration methods seem a logical and necessary area for government effort. The government-offered reward of $10,000 for the discovery of a valuable deposit of uranium may need to be extended to other minerals. Successful subsurface exploration may mean a necessity for perfecting deep-mining techniques in the United States. But we can expect that the greatest returns from exploration will be in foreign undeveloped areas where the efforts of the United States enterprisers must be associated with the local government. The great Cerro Bolivar iron deposit in Venezuela and the Labrador iron deposits, on which United States steel may be increasingly dependent, are examples of recent foreign discoveries.

The details of government *administrative and financial incentives* are generally beyond the scope of this discussion. But opportunities to lease government land adjacent to discoveries, long-term government contracts, and standing offers to purchase are encouragements to private enterprise to undertake the risks of exploration and heavy capital investment. A more favorable tax policy is another incentive. Government loans to small-scale miners are a logical step consistent with our need for materials and our national policy of encouraging small business.

The development of foreign sources is vital, both because of increasing United States dependence on these sources (see Chart VII-3) and because of the needs of the remainder of the free world. There is a need for actions which are advantageous to both the United States and the source country. Of the sources, Latin America and Africa stand first as potential producers of minerals, except for oil where the Near East is the great potential supplier. "To cite a few specific minerals in short supply, Africa has copper, cobalt, asbestos, industrial diamonds, chrome, manganese, and other minerals; Latin America has copper, iron ore, manganese, lead, zinc, tin, and bauxite. In the high tonnage materials such as oil, iron ore, zinc, manganese, bauxite, and possibly copper, there is little doubt that the less developed areas have high grade reserves which, after satis-

fying their own expanding requirements, are able to supply the import needs of the rest of the free world for the next quarter century and beyond." [4] An input of money, equipment, technology, and management is needed. With assured political and economic arrangements, this input is likely to be forthcoming. Witness the rapid development of Canadian resources by Canadian and United States capital. But there are obstacles. Governments of undeveloped areas, particularly those recently risen from a politically dependent status, distrust materials development or threaten expropriation. Moreover, private investors remember the 1930's when there was practically no market for raw materials. Here, again, government has a role in making political agreements and in long-term contracts for building the stockpile, guaranteeing prices and granting loans. (See chapter VIII.)

There are actions in the international field which are entirely within the power of the United States. There are tariffs on some raw materials for which we are bound to be net importers (Chart VIII-2). These tariffs are, in effect, partial blockades against imports. Some may have been instituted with the excuse that they sheltered development of higher cost domestic sources. Other and less costly measures, such as subsidies (see "Subsidies on scarce materials," chapter XVIII) and long-term contracts to United States producers, are available to achieve the same objective. The Buy-American legislation left over from the depression of the 1930's, constitutes another blockade against imports. This has applied to some stockpile purchases and to some materials used by contractors producing equipment and supplies for the government. Stockpile purchases have been made from United States sources at as much as 25 per cent above the cost of foreign supplies. This policy raises costs to the taxpayer and the economy, works against national security, and encourages a more rapid depletion of United States resources. In an economy of full employment and high production, the original reason for the legislation has disappeared. As a final point in the international field, the United States needs to pay some attention to export allocations of controlled items to assure that machinery and supplies for minerals development abroad are allowed to flow abroad in a priority indicated by our grave, long-range need for foreign materials.

In the long run, much of the responsibilty for providing an ade-

[4] PMPC Report, Vol. I, p. 60.

quate supply of materials falls on *technology*. We can do no better in summarizing the tasks of technology than to list those cited by the PMPC.

1. New techniques of discovery. The use of airborne instruments and airborne mapping techniques in the discovery of the great high grade Cerro Bolivar iron ore deposit in Venezuela is an example.
2. Utilize materials which do not yet have an economic use. The case of titanium, cited above, is an example.
3. Improve techniques for recovery of minerals once used. For example, 100 million tons of steel require 54 million tons of scrap in their production. Recovery of manganese from the wastes of steel furnaces is another example.
4. Economical processing of low grade ores. The successful processing of taconite, a low grade iron ore in abundant supply in the United States, is an example of particular importance, since the high grade areas of the Mesabi range are practically exhausted.
5. Substitute renewable resources for minerals. The increased use of plastics made from agricultural and forest products is an example.
6. Substitute more abundant for less abundant materials. The substitution of aluminum for copper in electric transmission lines is an example.

It seems that at least one more task should be added to the above six. Products using minerals should not be overdesigned for their functions but, rather, should be designed for a maximum reasonable life with minimum minerals consumption. To select a hypothetical example of the future, the minerals situation might one day force us to 2000-pound automobiles, which might be driven an average of ten years at forty miles to a gallon of gas – unless by that time technology has substituted a vegetable fuel or an everlasting atomic candle.

II: AGRICULTURAL AND OTHER RENEWABLE MATERIALS

The problem in the long range is one of soil and water conservation and of the wise application of technology by government and private enterprise. These basic resources – soil, water, climate, and a well-developed and expanding technology – are available for the

forseeable future. The feasible expansion of United States production is fantastic and heartening. Various studies used by the PMPC estimated between 85 and 200 per cent feasible expansion of farm products, in the next 25 years, from present acreages. With forest products as the major exception, the teamwork between government and private enterprise seems to assure a continuing United States condition approaching self-sufficiency in renewable products. There are, of course, specific commodity exceptions to this statement, some of them important (natural rubber, for instance), which are mentioned in the following discussion. But, in general, the United States situation as to renewable resources lacks the urgency of the minerals situation described in the PMPC quotation in the opening section of Part I of this chapter. This is not to say that non-renewable resources do not require continual effort and attention. But the program, public and private, is underway and fairly well accepted and understood in the United States.

The most pressing effect on our national security of the renewable resource situation arises from the current, and probable future, inability of many portions of the free world to produce enough food to feed their people adequately. This makes for political and economic instability and creates a potential demand on United States agricultural resources.

REQUIREMENT FOR RENEWABLE RESOURCES

Scope of requirements today. The United States citizen, on the average, uses 5,700 pounds of renewable materials a year. This includes such items as cotton, pulpwood for paper, and 1600 pounds of food. To obtain this supply, we farm about the same acreage as does the USSR. In fact, a definite downward trend in acreage requirements is due to (1) replacement of animals by machines, thereby reducing need for pasturage and forage, (2) application of improved technology, and (3) use of fertilizer. When we think of requirements for renewable resources, we should be acutely conscious of the components making our high rate of production possible. These are basic. We have mentioned soil, water, and technology. There are also machinery and fertilizer, which are rising requirements, and manpower, which is a falling requirement, due to in-

creased production per man-hour. In 1920 each agricultural worker fed 9 people; in 1950 he fed 14½; by 1975, based on the current trend, he will feed 21 people. In considering the scope of food requirements, it is useful to think in terms of calories. The United States citizen eats, on the average, 3250 calories per day. Over half the people in the world eat less than 2000 calories daily.

Expansion tomorrow is substantially a function of expanding population. In the case of food, the PMPC estimates a need for a 42 per cent expansion in food production and a 28 per cent expansion in nonfood farm production (cotton, tobacco, etc.) by 1975, or an increase of about 40 per cent over 1950 in all products except timber. It estimates a 10 per cent increase in demand for timber. The basic resources are available to provide the farm products, probably without increase in acreage farmed. Use of fertilizer, machines, and improved technology can assuredly do the job without appreciable reliance on foreign sources.

Turning briefly to the problem of timber, this is a resource the United States has erroneously treated more as a mine product than as a crop. We are principally dependent on our own resources. We imported about 1.4 billion cubic feet of timber from Canada in 1950, about one billion being pulpwood. Total consumption in that year was about 13 billion cubic feet. Put summarily, the rate of cutting of timber will, for a long while, exceed the rate of growth of new timber. The deficiency between growth and cutting will be in saw timber rather than pulpwood and fuel. With increasing scarcity and rising costs, there has been a shift to substitute other materials, many of them nonrenewable, for timber.

Requirements of free world. The renewable resources problems of our associates in the struggle against communism have three salient aspects. First, those able to obtain the necessary renewable resources, principally the NATO countries, are generally very dependent on imports. Thus, dependence means a necessity for either exports or aid from the United States to pay for imports. It also means vulnerable supply lines in time of war. This first point is difficult, but manageable with wisdom and cooperation, in international trade. Second, perhaps half the people of the free world are underfed and have always been underfed. Third, population — particularly in the underfed areas — is likely to increase at a rate far beyond the rate of increase of food production. The long-range

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threat to security, short of war, lies in the latter point. The amount of the requirement of the chronically underfed can be only a broad estimate. The Food and Agricultural Organization of the United Nations estimates that world food production must increase by 90 per cent in the 1950's in order to provide an average of 2,600 calories per day per person by 1960. This increase is more than unlikely; it seems impossible. The problem is increased by longer life, made possible by improvements in health and sanitation, without accompanying reduction in births or rise in production. As an example, a malaria control program in Ceylon is given primary credit for the drop in death rate per 1,000 from 20.3 in 1946 to 12.6 in 1950. The birth rate remained 40.3 or the population is increasing at a rate which approximately doubles it in a quarter century. The Point IV Program was certainly wise in coupling productivity increase with health and sanitation measures. The latter measures assure a change from the widespread condition of chronic malnutrition into a condition of chronic famine unless productivity can be materially increased.

Defense requirements for renewable resources raise materially less internal United States problems than do mineral resources. Percentage-wise there is not a major expansion of demand above that of a full employment economy. The same United States citizens are eating and wearing clothes (see Chart VII-4). They desire to eat somewhat more, particularly in the armed forces. There is some shift in emphasis on products, the military demand for beef being an example. There are items from foreign sources that require attention. Wool and natural rubber (both objects of major synthetic programs) have been examples from the past. The items in this category require special security measures such as stockpiling, substitution, and synthetics.

The experience of World War II shows that about 20 per cent of food production goes to the military forces and to exports (the export portion, about 5 to 7 per cent of production, continuing to go abroad after the war). The two most pressing aspects of the wartime requirement are: (1) food and other supplies for allies – the size of this requirement probably will be limited by shipping, and (2) the possible fluctuations in production due to weather or other hazards beyond human control. These two aspects must be considered by us and our allies in our planning.

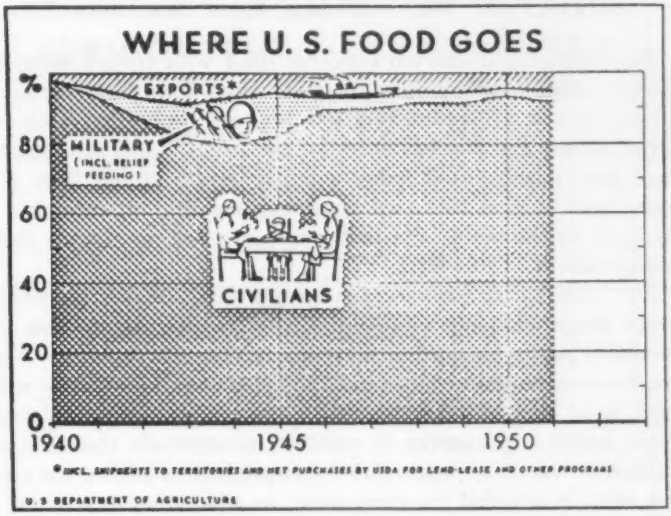

Chart VII-4.

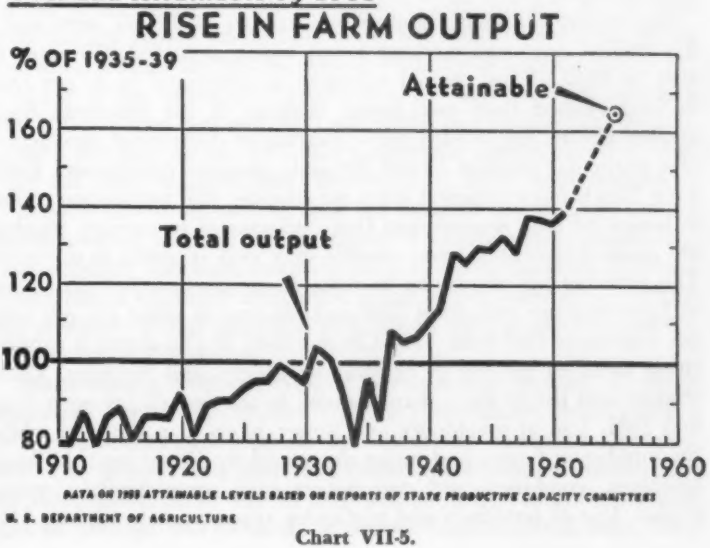

Chart VII-5.

SUPPLY OF RENEWABLE RAW MATERIALS

The following discussion concerns itself with certain aspects of the peacetime supply of farm products which contribute a readiness for emergency. The problem of the supply of timber has been mentioned above, and it needs energetic government and private attention. But efforts started today will not bear fruit for 25 or more years, and by that time, we hope, our security situation may be changed for the better. For that reason, we will not discuss timber considerations in this text.

The United States situation in farm products makes the maintenance of an adequate supply primarily an internal problem. The capability exists for necessary expansion (see Chart VII-5). There are, however, certain characteristics of this essential industry which need to be kept in mind. Its contribution in mobilization depends on its health in peacetime. It performs substantially the same production in war as in peace. But if this production falters, the entire war effort is crippled. In many ways, its adaptation to war and its problems therein (continued peacetime-type operation, need for machinery, shortage of skilled manpower) are similar to those of transportation (see chapter X).

Agriculture is a small business industry. In 1950 there were about 5⅓ million operators working farms which averaged 210 acres in size. In 1950, 75 per cent of operators as compared to 58 per cent in 1932, owned their own farms. Because of the industry's fragmented nature, any sudden major increase or decrease of production of a particular product almost certainly requires government guidance. This is more apparent when we consider that production comes in lumps by crop seasons and that decisions as to acreage planted are made irrevocably some months to a year or more in advance. The industry has shown an increase in production per man hour of 2 per cent per year since 1930 and per acre of about 1⅓ per cent per year since that date. (See Chart VII-6) It also shows a rapidly rising trend in the use of capital, machinery, and fertilizer. Farm tractors and trucks more than doubled in the decade between 1941 and 1951. Use of machinery and power more than doubled while the number of horses and mules decreased by 55 per cent. Milking machines, combines, and cornpickers each approximately quadrupled. Use of fertilizers and pesticides approximately tripled. The

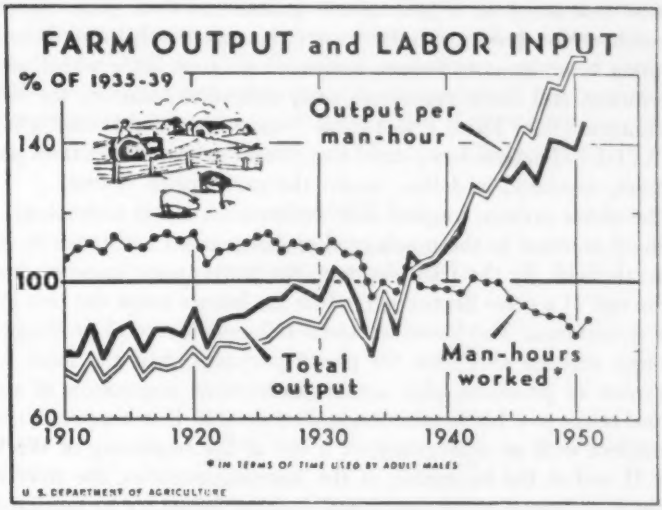

Chart VII-6.

farmer is becoming a small industrialist, even though 98 per cent of farms are family units. This trend is consistent with the rising cost of farm labor and the increasing difficulty of obtaining it.

Much of the increase in production per acre and per livestock unit (20 per cent between 1930 and 1950) can be ascribed to technology. But the farmer, with rare exceptions, cannot afford to conduct his own research and development. Such improvement is dependent on the research of state and national governments and on manufacturing industry which strives to improve farm machinery, farm supplies, and farm methods. And, as a final point on improvements, one of the major difficulties is that of persuading the individual operators in this atomized industry to use the most up-to-date technology of production.

Maintaining and expanding agricultural supply. Through teamwork between producers and the government, there exists a fairly well-developed program for stabilizing agricultural production. This program is a subject of considerable political controversy. Its components have shifted and will probably continue to shift and no attempt will be made to discuss them in detail here. They

consist essentially of a government-guaranteed floor price (parity payments) for production from acreages previously agreed to at planting time, loans to finance carryover of crops for a period after harvesting, and other expedients such as special financing for farm mortgages. (See "Farm Prices" and "Agricultural Subsidies," chapter XVIII.) Congress has placed the greater proportion of farm production, measured in dollars, under the parity price system.

The above system, coupled with government aid in technology, is in sharp contrast to the much smaller government assistance in the minerals field. By the parity system, the government assumes most of the risk of a price fluctuation, while the farmer reaps the benefits. The government also exercises some influence on total production through acreage allocation for parity purposes. And the loans for carryover of products, plus actual government acquisition of surpluses, result in a hit or miss stockpiling system. If it happens to hit coincident with an emergency, as it did at the beginning of World War II and at the beginning of the Korean hostilities, the store of products is bound to be useful and may be necessary to maximum mobilization. But the program was not designed or legislated for national security purposes, and the World War II benefits received were purely coincidental.

The problem of maintaining supply contains one important unpredictable element: weather and similar factors beyond human control. Recessions in production due to such causes can only be handled by stockpiling and by substitution. The latter method is effective only if the decrease in production is in a limited number of products rather than across the industry. The remaining problems of supply are predictable but must be predicted at least a growing season in advance to enable anything to be done. Sudden crises, such as failure of the crop of an ally, have to be met from stocks on hand or by slightly tightening our own belts. As to expansion of production, there are usually some resources in the agricultural industry which can be brought into production by the end of the next growing season (longer for animals), providing the farmer can get the necessary components of production. These components include fertilizer, machinery, and labor. Availability of acreage is not the bottleneck. The amount and rate of expansion capability in the short run is no more than that effected during World War II (see Table 2) and is, in fact, almost certainly considerably less. The United States had

very fortunate farming weather during World War II and, in addition, started from a rate of production somewhat below normal capacity. In 1952, the Department of Agriculture estimated that by 1955, agricultural production could be expanded 20 per cent above 1950 production if this were necessary and if the machinery, fertilizer, and other resources were provided (see Chart VII-5).

TABLE 2

AGRICULTURAL PRODUCTION
(in percentage of 1935–39)

1940	110
1941	114
1942	128
1943	125
1944	130
1945	129
1946	134
1947	129
1948	141
1949	140
1950	138
1951	139
1952 (est.)	147

Source: *Report of the Secretary of Agriculture*, 1951, p. 7.

SUMMARY

Raw materials are discussed under the general categories of renewable and nonrenewable, and actions are outlined to give that sound peacetime situation which is an essential to an adequate mobilization base. It is important to keep in mind the elements of time, distance, mass, and cost in appraising the supply of any particular material. Materials are an essential element of industrialization and of military strength. Nations are interdependent for materials, and this creates one of our problems of free world security.

The summary PMPC statement of the long-run objective of materials policy for the United States is as follows: " . . . to insure an adequate and dependable flow of materials at lowest cost consistent with national security and the welfare of friendly nations."

Turning to the United States minerals position, our country is consuming more than it produces, and it seems certain that this situa-

tion will worsen progressively. Each year we use more of each kind of mineral and more kinds of minerals. In general, our principal allies are even more dependent than ourselves on foreign sources. Mobilization and war create a demand for minerals which is much greater proportionately than the increase in requirements for other resources. Because of the time needed to develop, transport, and process minerals, adequate preparedness is dependent on a sound peacetime program using policies also applicable to an emergency. These policies include exploration, financial incentives to producers, development of foreign sources, and improved technology. We are greatly dependent on foreign sources for nonrenewable materials.

The United States situation with relation to agricultural and other renewable raw materials is much better than our minerals situation. The supply of saw timber is an exception. Adequate soil, climate, and water exist. Research, the use of machinery, government planning, and aid in many forms — all contribute to a healthy peacetime industry. Manpower is a problem, but not a critical one.

As in the case of minerals, the international food situation presents a security problem but, primarily, for different reasons. There is a chronic shortage of food in many parts of the free world. Such shortages are potential causes of dissatisfaction and of political instability. Furthermore, they retard industrialization, which is the principal avenue to economic advance and to adequate military strength.

TOPICS FOR DISCUSSION

1. Viewed from the standpoint of raw materials alone and assuming current technological methods, is it practicable to raise the standard of individual consumption of the whole world to that of the United States?
2. Examine the (*a*) iron ore, (*b*) uranium ore requirements of the United States with respect to the elements of time, distance, and mass.
3. Examine the statement, "One of the major problems confronting free-world collective security is equitable access to raw materials." Is this equally true in peace and in war? Discuss.
4. Do you agree that "mineral requirements are more a function of technology and industrialization than of population"? Support your position.
5. Outline the raw materials situation current at the time when it will be taught to your grandchildren in their college years.
6. Outline a long-term minerals policy for the United States and dis-

cuss by comparing it to our government agricultural policy under such headings as: objectives, research and development, price stabilization, government finance, tariffs, imports and exports.

NOTE: It is suggested that the student read the next chapter in connection with consideration of the above topics.

SUGGESTIONS FOR ADDITIONAL READING

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STRATEGY OF MATERIALS

The Objectives and Methods of Materials Strategy · Stockpiling · Expanding Domestic Supply in an Emergency · Foreign Supply in an Emergency · Division of Supply among Allies · Restricting Requirements for Raw Materials · Agriculture in an Emergency · Summary · Topics for Discussion

THE PURPOSE OF THIS CHAPTER is to examine methods for bringing materials capabilities and requirements into balance in an emergency. It discusses both emergency measures and those peacetime preparedness arrangements which would not normally be undertaken if the threat of aggression were removed from the world.

THE OBJECTIVES AND METHODS OF MATERIALS STRATEGY

The principal objective of a program for materials supply in an emergency must be the provision, *at the right place and right time*, of materials which are essential to the emergency effort. This objective has a priority equal to all other emergency objectives and overriding most of them. To cite a specific example, the first basic undertaking of the allied strategy of World War II was maintenance of the war-making capacity of the United States and the United Kingdom. Stated in different language, this meant that food for Britain, threatened by blockade, and protection of communication lines over which essential raw materials flowed to both nations were first priorities. Protection of production areas for scarce materials and protection of essential manufacturing industry become undertakings of equally high priority. There can be no priority among essentials, only an equalizing of calculated risks.

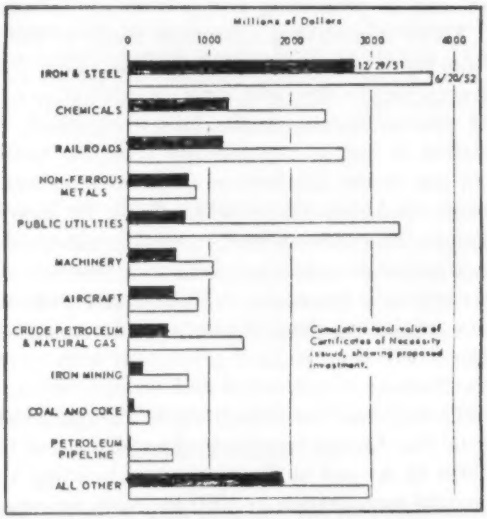
The objective of an adequate quantity of materials, available at the right place and right time, produces problems of transportation, of reserves, and of processing into a form for fabrication or consumption. There is always a narrowest place in the flow of any material from farm, mine, sea, and well to the place of consumption. This bottleneck may be the farm, mine, or other source of extraction, the line of communication, or the processing plant. The progress of mobilization is one of continuously changing bottlenecks. The breaking of one passes the bottleneck position to some other step in the process. And since the appetite of war for many materials is insatiable, there is no such solution as a balance maintained over any considerable period of time. That element of time is not yet whipped when the material is extracted. Adequate raw materials readiness includes measures throughout the entire chain of activity.

This chapter will concern itself principally with measures to deal with the bottlenecks of extraction and transportation. But an adequate mobilization base must also include adequate industrial processing plants. The United States was short of these at the beginning of World War II. As part of the program of building a mobilization base, the partial mobilization in 1950 included an expansion of this basic processing capacity, particularly steel making, petroleum refining, and aluminum production. This expansion, added to the standby processing capacity from World War II for materials such as magnesium and synthetic rubber, has been designed for the dual purpose of meeting the needs of a full emergency and of providing normal civilian demands plus military needs on a plateau of preparedness. Note that Chart VIII-1 shows appreciable tax assistance (discussed in detail in chapter XIII) to the extraction, transportation, and processing of materials.

Parallelism with strategy of preparedness for other reasons. There is nothing new in principle about the essentials of readiness in the raw materials field. For a long while, military manpower has been managed on the principle of having reserve forces behind active forces. In raw materials, we need ready reserves – in stockpiles and in semiprocessed form – to add immediately to the normal peacetime flow. For industry, this is the same principle on which we have provided standby plants, machine tools, and production lines.

Military mobilization means expansion of armed forces, and the term "industrial mobilization" connotes expansion of production and

GOVERNMENT ASSISTED INDUSTRIAL EXPANSION — 1950-52



Source: Sixth Quarterly Report—Director of Defense Mobilization.

Chart VIII-1.

expansion of the labor force. Raw materials mobilization is a part of industrial mobilization and includes extraordinary measures to expand the production of these materials. The companion principle to expansion of supply (whether it be manpower, munitions, raw materials, or other resources) is the principle of restriction of demand for less essential and nonessential uses. There is a further related principle which might be called that of "substitution and improvisation"; for instance, women and adolescents replace men in the factory and on the farm, and less scarce materials — even though sometimes not so satisfactory — replace scarce materials.

Through mobilization of manufacturing industry, by expansion, by conversion, by maximum utilization, a *pull* is generated on raw materials which tends to expand, convert, and utilize them to the maximum in the most efficient support of a war effort. At the same time, it is necessary to generate a direct *push* on raw materials supply itself, pressing it in the desired direction to give support to in-

dustry in an emergency effort. This chapter is concerned principally with the pushing measures. Chapter XIII, "Mobilizing Industrial Resources," discusses the production controls for raw materials which are *pulling* measures. Like all other security measures, those pertaining to raw materials can be divided roughly into *preparedness or readiness* measures, which strengthen the mobilization base, and *emergency* measures instituted in time of crisis.

For purposes of presentation we will start the detailed discussion of raw materials policies for security with the only program certainly capable of meeting the first surge of emergency demand – stockpiling – and will then consider the other measures according to the following outline:

I. Supply or capabilities measures
   1. Stockpiling
   2. Preparedness and emergency measures to expand production at home; for example, research and development, special production incentives in emergency and standby reserves in the ground
   3. Preparedness and emergency measures pertaining to foreign production, including supply of allies

II. Demand or requirements measures
   1. Substitution, including use of synthetics
   2. Conservation and reclamation; for example, care of fabricated items and recovery of scrap
   3. Austerity standards of design and of military requirements for end products using scarce materials

STOCKPILING

Principles of stockpiling. The contents of stockpiles constitute readiness in two ways. First, they are strength-in-being for the first surge of demand of an emergency expansion of military production. Second, they supplement the flow of production of the particular item stockpiled until such time as expansion of that flow catches up with demand – if it ever does catch up. The theory of stockpiling is no different from the homespun rule of saving for a rainy day. The book of Genesis records that one of the Pharaohs charged Joseph with the responsibility for stockpiling food during seven years of

plenty to guard against the seven subsequent years of famine that were revealed in Pharaoh's dream. To cite another example, a great many individuals have bank savings accounts in which they stockpile purchasing power against an emergency in their private lives.

From the standpoint of security, governments can stockpile items in five ways: at the source (oil reserves in the ground), as extracted raw materials, semiprocessed goods, finished goods, or by taking cognizance of the normal reserve of supplies existent in the civilian economy (for example, the inventory of unfabricated copper in the hands of dealers and manufacturers). It should be noted that the further along in the process of production an item is, when stockpiled, the more effective the stockpiling if an emergency occurs. The storing of processed materials includes labor, power, other contributions of manufacturers, and particularly leadtime in the stockpile. The inventory of finished equipment of military supplies held by the armed services for immediate use in case of emergency is, in fact, a stockpile of raw materials as well as of finished goods.

The fifth method of stockpiling – taking cognizance of available supplies in the civilian economy – is an important approach in planning reserve supplies for a condition of a high plateau of preparedness. Otherwise, the military services would feel bound to press for possession of huge stockpiles of civilian-type items such as food, clothing, and petroleum products. Experience shows, however, that the first surge of military demand for the great mass of civilian-type items (food, shoes, etc.) can be met from commercial sources if forehanded preparedness measures are taken to divert such supplies to military uses. This generalization has exceptions in some items, and it is much less applicable to some of our allies, for example, the United Kingdom which is very dependent on imports and normally has limited peacetime inventories of civilian-type items.

Stockpiling of raw and semiprocessed materials is essentially an operation to be conducted at times other than emergencies, and the program, if successful, must be virtually completed prior to the beginning of a major emergency. This principle seems self-evident. During an emergency, the demands of production are almost certain to take the flow of available supplies. At such time, attempts to further a stockpile program amount to competition with requirements of industrial production and therefore cause inflated prices and difficulties for our allies. This is not to say, however, that we should

refrain from stockpiling a material that happens for a short period to be readily available as a result of the lag of production getting underway at the beginning of an emergency.

Stockpiling should be against specific requirements. This principle presents a Gargantuan task of estimating and analyzing to determine (1) what will our over-all requirements be in case of a major emergency, (2) what is the likely flow of materials production during the emergency, and (3) the difference between (1) and (2) for each item for the stockpile. This difference gives us the quantity to be procured and held. It is thus apparent that the raw material stockpile is based on the war plan and is derived by a calculation from the sum total of civilian and military demands over the period of a long war. (See "Requirements" and charts II-1 and II-2, chapter II.)

Limitations and problems of the stockpiles. Major additions to the stockpile should be made only at certain times, when the purchase of materials will not disrupt the market or upset current manufacturing production. This means that the building of a stockpile of the size needed by the United States is a long-term matter. Furthermore, as stressed in the previous chapter, any expansion of production of most raw materials has a long leadtime, so that the stockpiling program must be a matter of long-term contracts for many items. The stockpiling program is also limited by the characteristics of some materials. Perishable materials such as rubber must be stockpiled with a system of turnover. This turnover inevitably puts the government into the business of selling to the general civilian market and in competition with private enterprise. Some materials such as iron ore and petroleum are bulky or are both bulky and perishable, unsuitable for stockpiling in the quantity needed for a long emergency. In such circumstances, our policy must provide other measures such as stockpiling in the ground, rapid expansion of production, substitutions, and acute restriction on the civilian economy.

There is some danger that the possession of a large stockpile may develop a complacency which would be a brake on the necessary peacetime efforts of exploration, expansion, and technological improvement which need to be pressed because of our worsening raw materials situation. Another problem pertaining to the normal civilian economy is the possible concern of raw materials producers that the stockpile is really a surplus hanging over the market. For this

reason, as well as to assure continuance of our security reserve, the stockpile should not be used as a stabilization device except in very extraordinary circumstances. This is not to say that we should flout incidental benefits of stockpiles to the stabilization of a peacetime economy. These can be reaped, since assured steady purchasing over a long period is a strong force for stabilization and for a high rate of production. Recourse to the stockpile may be justified in case a foreign business combination attempts holdup tactics. But robbing the stockpile in a period of peacetime boom, as occurred after the end of World War II, may leave us critically unprepared for an emergency a few years later – as it did for the Korean aggression.

We have not attempted to list all the problems of stockpiling. But the final one here mentioned should be stressed. The best estimates of requirements are going to change from year to year with changes in war plans, changes in plans for rates of mobilization, changes in weapons, and changes in estimates of the accessibility of different foreign sources of supplies in case of emergency. There is the further imponderable of the shifting requirements of our allies in case of emergency. The supply of essential materials for them from their own sources, from foreign sources on which we also depend or from our own indigenous resources is a certain problem of an emergency.

History of United States stockpiling. It may be well to proceed, in this part of the discussion, from the end rather than the beginning. By 1952, the United States stockpiling program covered 74 items with a target of a 7.5 billion dollar stock at 1953 prices. The materials actually on hand were valued at 84 billion, and there were about 2 billion dollars worth of materials on order. (See Table 1, which lists most items being stockpiled as of 1952, and also certain items receiving attention but which were not being stockpiled in 1952.) These materials are generally spoken of as "strategic and critical" materials, since this term was part of the title of the Congressional Act authorizing the program. Security classification prevents a complete listing of the items or places of stockpiling. Our experience between January 1, 1950 and mid-1951 indicates the scope of United States dependence on imports of materials in Table 1. Approximately 3.8 billion dollars worth were imported, of which about 28 per cent went into the stockpile, the remainder going to fill the requirements of industry. Returning to the money value of the stockpile content, one should realize that such an over-all estimate does not give a very

accurate appraisal of the situation. The dollar values fluctuate with the price level. The stockpile could be almost completed in terms of money value and yet still be entirely lacking in a few key materials very necessary to mobilization. In fact, the stockpiling was very unbalanced in the early 1950's.

TABLE 1

LIST OF STRATEGIC AND CRITICAL MATERIALS FOR STOCKPILING

Group I

1. Abrasives, Crude Aluminum Oxide
2. Aluminum
3. Antimony
4. Asbestos, Amosite
5. Asbestos, Chrysotile
6. Asbestos, Crocidolite
7. Bauxite, Metal Grade
8. Bauxite, Refractory Grade
9. Beryl
10. Bismuth
11. Bristles, Hog
12. Cadmium
13. Castor Oil
14. Celestite
15. Chromite, Chemical Grade
16. Chromite, Metallurgical Grade
17. Chromite, Refractory Grade
18. Cobalt
19. Coconut Oil
20. Columbite
21. Copper
22. Cordage Fibers, Abacá
23. Cordage Fibers, Sisal
24. Corundum
25. Cotton, Extra Long Staple
26. Diamonds, Industrial
27. Feathers and Down, Waterfowl
28. Fluorspar, Acid Grade
29. Fluorspar, Metallurgical Grade
30. Guayule Seeds & Seedlings
31. Graphite, Amorphous Lump
32. Graphite, Crucible Grade
33. Graphite, Lubricant and Packing Grade
34. Hyoscine
35. Iodine
36. Jewel Bearings, Instrument Jewel except Vee Jewels
37. Jewel Bearings, Sapphire and Ruby Vee Jewels
38. Jewel Bearings, Watch and Time-Keeping Device Jewels
39. Kyanite
40. Lead
41. Magnesium
42. Manganese Ore, Battery Grade
43. Manganese Ore, Chemical Grade
44. Manganese Ore, Metallurgical Grade
45. Mercury
46. Mica, Muscovite Block, Good Stained and Better
47. Mica, Muscovite Film
48. Mica, Muscovite Splittings
49. Mica, Phlogopite Splittings
50. Molybdenum
51. Nickel
52. Opium
53. Palm Oil
54. Platinum Group Metals, Iridium
55. Platinum Group Metals, Platinum
56. Pyrethrum
57. Quartz Crystals
58. Quinidine
59. Quinine
60. Rare Earths
61. Rubber, Crude Natural
62. Sapphire and Ruby
63. Shellac
64. Silk
65. Sperm Oil
66. Talc, Steatite, Block
67. Tantalite
68. Tin
69. Tungsten
70. Vanadium

39888 O—54—p. 8——29

71. Vegetable Tannin Extract, Chestnut
72. Vegetable Tannin Extract, Quebracho
73. Vegetable Tannin Extract, Wattle
74. Wool
75. Zinc

Group II

Agar
Bauxite, Abrasive
Cryolite, Natural
Diamond Dies
Emetine
Graphite, Crystalline Fines
Mica, Muscovite Block, Stained and Lower
Mica, Phlogopite Block
Optical Glass
Pepper
Platinum Group Metals, Osmium
Platinum Group Metals, Palladium
Platinum Group Metals, Rhodium
Platinum Group Metals, Ruthenium
Rutile
Selenium
Talc, Steatite, Ground
Zirconium Ore, Baddeleyite
Zirconium Ore, Zircon

Source: Munitions Board, *Stockpile Report to the Congress*, August 15, 1952.

An account of the United States historical experience in stockpiling is helpful for the purpose of giving warning against repetition of that experience. The first Congressional stockpiling legislation was passed in 1939. Inadequate funds were appropriated, the act contained a "Buy American" clause, and the action was "too little and too late," since the war in Europe quickly placed pressures on raw materials all over the world. Furthermore, we were quickly cut off from many essential materials by the Japanese and restricted in access to others by German submarines. We came to the end of World War II with a considerable but unbalanced stock of materials in the hands of the government, as a result of wartime government purchasing at home and abroad for resale to private industry. These stocks were not legally treated as a reserve for the stockpile but rather as surplus government property. Demand for civilian goods was high, however, and raw materials were not plentiful. Industry bought a considerable portion of the war surplus materials. In 1946, Congress passed the Strategic and Critical Materials Stockpile Act which facilitated transfer of the remaining unbalanced and depleted war stocks to the stockpile. The Act provided a sound basis, with the exception of one aspect, for proceeding with stockpiling. The major weakness was the "Buy American" clause. This is incongruous since one of the chief purposes is to get within the continental United States a larger supply of the materials needed than would otherwise be available. If we merely move materials

from United States ground to United States stockpile, we gain time and save some labor and other resources in case of emergency, but we do not expand our total supply. Development of the available United States reserves should certainly go forward, but other methods such as subsidies should be used to encourage domestic producers. (See chapter XVIII.)

The Congress did not provide adequate stockpiling appropriations initially. It took some time for leadership to realize that stockpiling is really a vital part of the pattern of our national security, not a marginal security program to be financed in a priority after everything else and hence starved or depleted in order to make effective some established ceiling on defense expenditures. The implementation of this realization came with adequate appropriations after the beginning of the Korean war. The action at that time was not "too little" but was again "too late." There were two consequent disturbing effects. First, the pressures on raw materials needed for United States partial mobilization, coupled with stockpile purchasing, resulted in a great increase in the estimated dollar costs of the complete stockpile and hence in the needed appropriation (see Chart XVIII-2, showing price rise in selected sensitive commodities.) It is true that some of this increase to the $9 billion point mentioned above resulted from the larger estimates of requirements necessitated by the decision to provide an industrial mobilization base. The second disturbing effect was on our allies. These countries purchase materials from the same foreign sources as does the United States. They were critically short of foreign exchange to pay for these materials even at normal prices. United States demand (together with speculative United States buying) forced prices up and created grave difficulties and even financial crises for some of our allies.

Certain other areas of action for adding to the stockpile should be mentioned. The Agricultural Act of 1949 provided that surplus agricultural products may be bartered for raw materials. The act authorizing the Mutual Defense Assistance Program of the United States contains clauses which look hopefully toward the acquisition of critical and strategic materials for the stockpile. The European Recovery Program Act of 1948 envisaged that 5 per cent of the local currency equivalent (counterpart) of any grants in aid would be allocated by the nation concerned to the United States for local expenditures for strategic materials and other United States local needs. (In 1951

counterpart purchases were providing about 3 per cent of additions to the stockpile.) Yet these methods of acquiring materials seem unlikely to be very fruitful. The countries receiving substantial United States assistance are usually short of raw materials and have to purchase them in the same world market used by the United States Or if they do have the materials, they are usually short of foreign exchange, and scarce raw materials can be sold on the world market to obtain this exchange. If they give up materials to the United States in a "mutual assistance" arrangement, the net result may be to continue their foreign exchange difficulty and to cause them to ask the United States for more "mutual aid." The discussion probably sounds to a taxpayer as if the United States can not win in this business. And we probably can not, short of paying the world price in dollars for the materials we want. There is, however, one area of the mutual aid program which can be helpful to the national stockpile in the long run. The Point IV and similar programs which include aid to underdeveloped areas in development of raw materials resources serve to expand world supplies and thereby make easier the acquisition of materials at an acceptable cost. (Chapter XXI discusses Point IV.) These programs also stimulate consumption through increased industrialization and so increase demand for materials.

Operation of stockpiling. After a brief discussion of government organization in the stockpiling operation, we will discuss the form and location of storage of materials and shifts in requirements. The subject of purchasing has been discussed in the preceding section. Government administrative processes in determining stockpiling policy are likely to shift over a period of time. But certain functions, relationships, and responsibilities seem relatively constant. First, the basis of requirements comes from the plans of the Joint Chiefs of Staff combined with estimates of the State Department, Central Intelligence Agency, and other agencies as to accessibility of foreign sources and needs of allies. (See Chart VII-3 for an indication of our dependence.) The plans have to be converted into specific materials requirements, and this is the job of the Department of Defense (Chart II-1). The determination of what and how much to provide, to include minimum civilian requirements, is a matter for interdepartmental consultation. For example, the integration of estimates of domestic production is the task of the Bureau of Mines in the

Department of the Interior. Supervision over the interdepartmental consultation falls within the province of the Office of Defense Mobilization. Coordinating of purchasing should be centralized. In the early 1950's, the General Services Administration was undertaking most of the purchasing, but the procurement responsibility has, historically, shifted from agency to agency. In a major emergency, any prior stockpiling purchasing program abroad is bound to be engulfed in larger foreign economic operations (economic warfare, aid to allies, etc.) of our government. The purchasing becomes more and more for use in current production and must be coordinated with allies. It is likely, therefore, that an emergency agency, such as the World War II Foreign Economic Administration, would acquire responsibility for foreign procurement.

The form in which materials are stored is an important policy matter. They could be identified and left stored in the ground. The United States has not had a policy of counting such reserves in the official stockpile although this method is the only feasible way to "stockpile" petroleum and some other items. There is a financial drawback to stockpiling materials in processed form (aluminum rather than bauxite, for example) since this action uses up appropriations faster than storage in raw form. Moreover, if a material is processed beyond a certain point, it may be in an obsolescent form when needed. On the other hand, stockpiling of some materials in the raw form – bauxite is again used as an example – leaves them a long way from being usable and may incur the hazard of possible enemy interference with processing plants. Since the stockpile is a capital investment and a national asset, it seems that, in the long run, materials should be processed up to a point where there begins to be danger of obsolescence. But this means increased appropriations as compared to holding the materials in raw form. Most materials are stored in government facilities. In mid-1951 there were 210 government storage locations, the general policy being to store more bulky materials near industries where they will be used. Storage brings with it obvious problems of maintenance cost (which is minor) and of protection against enemy action. There has been no attempt to maintain a stockpile through arrangements with industry to hold minimum inventories of selected materials at all times.

Shifts in stockpile requirements occur not only from changing war plans but also as a result of progress in other fields of raw materials

preparedness and progress of peacetime technology. For example, even the most imaginative planners of 1940 did not foresee the current demand for uranium. Discovery of new domestic supplies may lessen the stockpiling target for an item. The possibilities of peacetime technology are exemplified by wool, which is on the list of materials to be stockpiled. Civilian industry embarked in 1951 on a large synthetic wool program, receiving tax assistance from the government for this program as a defense measure. (See Chart VIII-1 and discussion of accelerated amortization under "Expansion of Facilities," chapter XIII.) The net result is to decrease the stockpile target for wool, even as the existence of a large synthetic rubber capacity decreases the stockpile requirement for natural rubber.

Stockpiling agricultural products. Table 1 shows that some renewable products are included in the list of strategic and critical materials for stockpiling. The great mass of agricultural products essential to sustaining the economy in a war effort have not, as of this writing, been considered for security stockpiling. There is a *de facto* reserve in the economy's pipeline from farm and forest to market. This reserve is no different from the similar reserve of mineral raw materials in inventories held by private enterprise along the pipeline of the industrial process, but the emergency pull on it is much less than on mineral materials. In addition to the pipeline reserve, the operations of the government's agricultural stabilization policy result in the generation of stockpiles of agricultural products. Part of these are stored by producers against government loans, and part are purchased outright by the Commodity Credit Corporation (CCC) of the Department of Agriculture. The objective of these operations is stabilization of farm prices and farm production, and they were not conceived or planned to provide insurance against a security emergency. It has been customary to think of agricultural commodities held by the government as "surplus," hanging over the market, rather than as a "stockpile." Yet the initial steps of United States World War II mobilization were furthered by the happy coincidence that the CCC had large surpluses on hand which could be used to support allies, to provide feed for expanding milk, meat, and egg production, and to provide cotton for armed forces needs. The equivalent effect might have been attained in part by immediate civilian rationing – but it would have been harder.

Stockpiles of agricultural products seem a matter for serious con-

sideration. The simultaneous occurrence of an emergency and a poor crop year, particularly following a year when the agricultural stabilization policy had been successful in its objective of avoiding carryover of any large surplus, would be serious. The scope of the problem for key items such as wheat, corn, and cotton, is not nearly so large as for many minerals when measured in proportion of a year's requirement. Whereas we might want to stockpile one or more year's emergency requirements of manganese, we would need only a portion of a year's requirements of wheat to supply allies and meet our own expanded demands at the beginning of an emergency.

The difficulties of operating a security stockpiling program for commodities which are also subject to a peacetime program for managing surpluses should be recognized. These difficulties are probably more political than economic. There would be the strongest political pressures to add non-strategic items to the stockpile, particularly in times of their surplus production. On the other hand, producers, with their strong political influence, might vigorously resist the stockpile for fear it would be used to stabilize the market and prevent windfall profits due to an unexpected surge of demand. In time of scarcity, the housewife might press to rob the stockpile. The problem of rotation of perishable supplies in the government stockpile tends to get the government into competition with private business. This latter problem might be overcome, however, by some expedient such as holding the stockpile in expanded inventories of producers and processors through a relatively inexpensive subsidy.

EXPANDING DOMESTIC SUPPLY IN AN EMERGENCY

Preparedness measures. Peacetime development measures are also preparedness measures (chapter VII, "Maintaining and Expanding Supply in Peacetime"). But, in addition, there are special measures particularly applicable to quick expansion in an emergency. Some commercial reserves can be stripped and prepared for extraction well ahead of the normal peacetime program. It is possible to identify, earmark, and do development work on both commercial and submarginal reserves, leaving extraction until an emergency. The PMPC cites bauxite as an example of a mineral in which

our commercial reserves are being rapidly depleted and for which it is probably desirable to lean materially on foreign sources in peacetime, delaying exploitation of domestic reserves. Our manganese, even though low grade, is perhaps in the same category. We might again face the World War II situation when, but for our Arkansas bauxite, submarine sinkings might have cut back airplane production. An emergency so serious that cost ceases to be a material consideration would cause us to use non-commercial reserves such as our low grade manganese ores. A wise readiness program needs to include technological effort toward use of these lower grade materials and processing plans for handling them.

We have mentioned standby processing plants above and also the need for plants for synthetics. Finally, but not least important, preparedness measures in transportation are necessary. The most immediate single project is the St. Lawrence Seaway which would provide a route, safe from submarine attack, from the iron ore deposits of Labrador to the industrial triangle of the United States.

Measures in time of emergency, discussed in this section, are also applicable in varying degrees to partial mobilization and to peacetime preparedness. Practically without exception, all the measures for encouraging and expanding manufacturing production are applicable in some degree to raw materials (see "Expansion of Facilities," chapter XIII). The government has, in past emergencies, been a principal purchaser of many mineral raw materials for redistribution to fabricators and a considerable purchaser of renewable raw materials. With this in mind, the interested reader should, at this point, scan chapter XII, "Procurement," since the procurement process can provide many aids and incentives to raw materials production. The various incentives and methods of assistance to producers include favorable consideration in allocation of machinery and other scarce resources and draft deferments for labor. Both the farm boy and the miner received special consideration in World War II. In 1942, for example, the Army furloughed 2,800 soldiers who had formerly been miners. Gold production was suspended in that year, in order to make more miners available for extraction of essential materials.

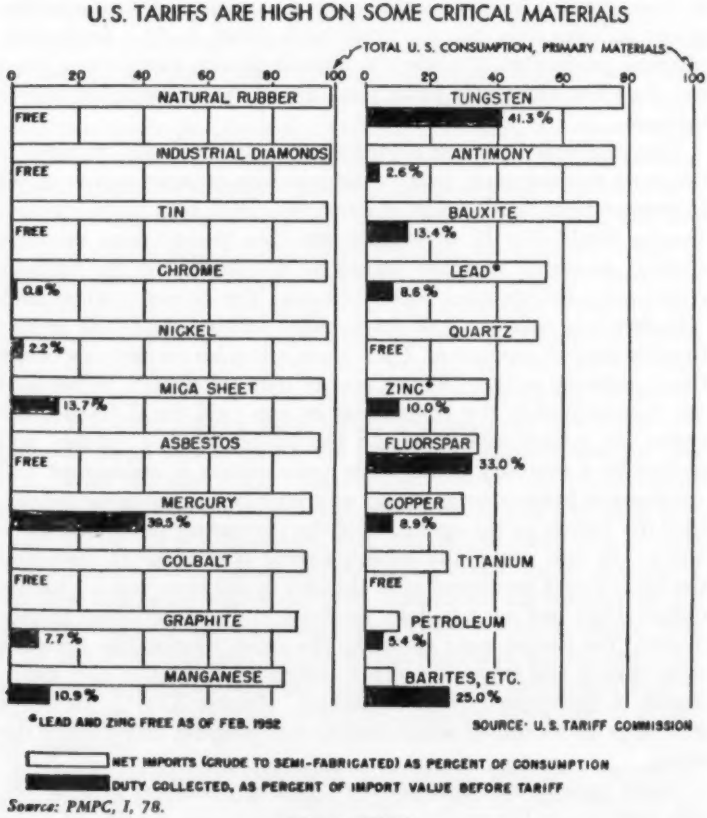
In the financing and monetary field, loans, long-term contracts, favorable tax amortization, and favorable pricing arrangements on both private and government purchases are incentives. The pricing

problem is a major difficulty of government operation in an expansion. Methods for handling it include: (1) uncontrolled prices, (2) guaranteeing a minimum price, and (3) subsidies. As an example of the use of uncontrolled prices, mercury was left uncontrolled until 1942. The price rose from $84 a flask in 1939 to $190, with a resultant material increase in production. It seems certain that this procedure is unacceptable except for special instances in which the general price level will not be greatly affected. If the price of all raw materials, including farm products, rose in this magnitude, the country would have a serious inflation. Furthermore, the interaction of domestic and foreign markets must be considered. Uncontrolled prices at home may cause a world-wide inflation. As a final point, physical production of materials expands slowly; therefore, a price rise does not necessarily bring forth quickly an appreciable supply increase.

The guaranteed price is a particularly suitable device in connection with the long-term government purchase contract and is useful in preparedness development of minerals as well as in an emergency. During World War II, it was also extended to most farm products ("most" measured in dollar value) by supplementing the farmer's return from private sales with a subsidy. The farmer worked on a "Heads I win, tails you lose" basis which assisted materially in getting the needed production. The farmer, when his market was below the guaranteed ceiling (90 per cent or more of parity), either sold the commodities to the government or was paid the difference between his private sale price and the ceiling. Such a subsidy will always be a necessity if the parity price system is maintained and government price controls are set at a level below the price guaranteed the farmer by the operation of the permanent peacetime legislation. The total cost of this subsidy during World War II, including the two years it continued after the end of the war, was 2.1 billion dollars. Over half went to dairy products in direct payments to producers. We should note carefully the close relationship between maintenance and expansion of raw materials production and stabilization of the economy ("Price Control," chapter XVIII). Measures such as price incentives which further one program may disrupt the other.

While agricultural subsidies were paid to producers making private sales below the market price, the government subsidized some

minerals through public purchase from high cost producers above the government controlled price. This method, sometimes called the Premium Price Plan (see "Subsidies on Scarce Materials," chapter XVIII), can be used to bring selected high cost producers into production while still preserving a government-set ceiling price for the commodity. It assists the government in holding the line on prices paid to low cost domestic and foreign producers, whereas an uncontrolled price, rising to a level profitable for high cost producers, would mean an increase in the price paid to all other suppliers, both



Source: PMPC, I, 78.

Chart VIII-2.

foreign and domestic. During World War II, the government subsidized about 25 per cent of domestic copper production and about 50 per cent of domestic lead and zinc. It bought at a price acceptable to producers and resold to users at the ceiling price. The effect of this operation is the same as a protective tariff for selected high-cost mining firms. It is suggested as one of the feasible preparedness methods in lieu of the tariff and Buy-American policy for developing selected mineral resources in the interest of security. The subsidy can be paid directly to the producer making a private sale, or the product can be bought by the government and put in the stockpile. The traditional expedient of the tariff (see Chart VIII-2) hampers expansion of foreign sources, supports an unnecessarily high price level, and may encourage extraction of resources which it is in our best interest to keep in the ground for a full emergency.

FOREIGN SUPPLY IN AN EMERGENCY

The maintenance and expansion of foreign supply in an emergency have at least four unique hurdles. These are: (1) transportation (both the problem of movement of bulk and the problem of enemy attack), (2) protection of the source areas from enemy attack, (3) political arrangements with the sovereign state concerned, and (4) competition with allies and neutrals for the scarce materials. If the source of supply is a neutral, there may be competition with our opponent. This latter problem falls into the field of economic warfare discussed in chapter XIX.

Preparedness measures. The sensible course of action is to estimate peacetime foreign supplies which are likely to be denied in an emergency. Then stockpiling and other measures should be undertaken to assure the needed materials. Strategic plans and military preparations have to include defense of the areas of production on which we will continue to depend. Shipping and naval escorts have to be planned with the necessary degree of readiness. Farsighted political arrangements are required. Fortunately, the foreign sources of most materials we need are in the countries or possessions of allies, either the NATO, the Organization of American States, or of the Pacific Pact. But these countries are still likely to drive a business-like bargain with the United States in both preparedness and war.

They have requirements as well as we do – if not for the actual materials, then certainly for United States goods.

It is difficult, and probably unprofitable, to attempt any major distinction between purely preparedness measures and the peacetime measures for foreign development mentioned in the previous chapter. It is important to realize that essential portions of our mobilization base are located in the iron ore of Labrador and Venezuela, the oil of Latin America and perhaps the Middle East, the copper of Chile and Africa, the tin of Bolivia and Southeast Asia, the bauxite of Surinam and British Guiana, and the manganese of the Gold Coast and Brazil – to mention a few examples. The lead-time of development in foreign areas is usually longer than in the United States. Difficulties are often greater, due to factors such as unfavorable climate, transportation difficulties, and lack of skilled labor. As an example, the railroad to open the Labrador iron deposits was estimated to take four years to construct at a cost of $328,000 a mile for 360 miles. The precaution to remember is to start in peacetime if we are to expect returns in an emergency. In addition to private capital, the United States can, and has to a limited extent, used Export-Import Bank loans and long term foreign contracts to encourage development of needed materials.

Wartime measures. The purchase of goods abroad in an emergency can be broken into two categories: first, those items which never enter the United States but are purchased for consumption by our forces or perhaps for assistance to allies; second, those items purchased for import into the United States. It is somewhat misleading to make a distinction between raw materials proper and the purchase of processed goods. The latter include raw materials, although some of the materials in a particular item may not be on our scarce and critical list. But all such goods save labor and, if shipped directly to our forces, usually conserve precious shipping.

The United States experience in World War II on foreign purchases gives an instructive example. We obtained approximately 29.5 billion dollars worth of goods and services from foreign sources during the period 1940-1945. Of this amount, 7 billion was on reverse lend-lease and was purchased and used abroad, principally by the armed services. The raw materials in these goods were a drain on the total allied raw material pool. Another 7 billion dollars worth of goods were purchased by government corporations operating abroad.

Most of these goods were shipped into the United States. Fifteen billion dollars worth of goods were purchased by private United States traders who often had to obtain a priority on scarce allied shipping in order to get the goods into the United States. A total of about 20 billion dollars worth came into the United States during the years 1940-1945 inclusive.

We here make two points. First, the United States will probably continue to depend in the future on private enterprise rather than public purchasing for a large part of foreign buying in an emergency, if only for the reason that many foreign resources are tied to the United States through United States corporations. Second, a government agency needs to conduct a material part of the purchasing, because of the special measures often requiring special and even unorthodox political arrangements and disregard for price. Reasons for this course of action include the fact that private enterprise may find it hard to compete with purchasing of other governments, that there is oftentimes close supervision by governments of producer companies, and the fact that our government may be buying all of the available supply of a scarce material.

Our initial World War II experience in government purchasing abroad is not recommended for the future. When the Foreign Economic Administration was organized and given the responsibility for foreign purchasing in September 1943, there were six government corporations in the business. World War II practice indicates the necessity for a clean-cut division of agency responsibility between foreign and domestic procurement of materials. This is desirable because of the many related foreign programs (economic warfare, lend-lease or other type assistance to allies, allocation of shipping, diplomatic relations with other countries) in which the foreign procurement agency is logically involved. The partial mobilization after 1950 saw several government agencies in the foreign procurement business and one, at least – the General Services Administration – procuring for the stockpile both at home and abroad.

Some of the World War II experiences indicate possible difficulties of foreign raw materials procurement in a future full emergency. Mexican lead producers were unwilling to mine lead at any price because of their uncertainty over the frequent fluctuations in taxes. United States diplomatic intercession persuaded the Mexican government to stabilize the tax situation and this made production of

lead possible. The United States government advanced capital ($223 million) to foreign producers on the basis that it would be paid off in connection with deliveries. If the delivery contract was cancelled, the remainder of the loan was forgiven. Machinery and United States technical assistance were furnished foreign producers. By such methods, for example, we stimulated quartz crystal production in Brazil.

It is unlikely that another emergency will occasion the scramble in organizational measures and expedients of World War II. The various peacetime international development arrangements and the base of experience provided by partial mobilization should give a solid groundwork on which to build the maximum possible expansion. But any succeeding emergency may give rise to a problem which was troublesome in World War II. In general, we paid for materials from the underdeveloped areas in dollars and postponed producing the American (or Allied) goods for those dollars. The result was that many countries not actively engaged in World War II postponed the enjoyment of anything tangible in return for their materials. This might have set an acceptable precedent for the future if the United States postwar price level had not risen, thereby turning each raw material dollar into considerably less than 100 effective cents when these countries came to spend it. Hence, in the future, the United States will face the political problem of being pressed to allocate scarce machinery, automobiles, tractors, and other manufactured goods for export in time of emergency in order to persuade underdeveloped raw materials producing countries to cooperate. Such exports, at least to the level of adequate spare parts and replacements, are likely to be a necessary quid pro quo – particularly for any neutrals.

Division of supply among allies. The problem of a wise and equitable division of supply among allies in time of emergency or war is one of the most difficult of international economic operations. We will first discuss briefly the relatively simple problem of mutual support in military operational areas. Using World War II as an example, this mutual support varied in form from basic raw materials through processed goods and weapons to transportation and other services. The first United States forces in Britain, for instance, were fed in part from British stocks of food and used British petroleum products and British construction supplies. All of these items

were scarce because of an absolute world-wide scarcity, because the shortage of transportation, or because the United States was – as a result of some lack of preparedness – dependent on her ally to assist in making our forces operational. This type of mutual assistance accomplishes an over-all economy in a war effort and oftentimes is the only means by which the materials can be obtained at the right place at the right time. It is an extension of the "cross and common servicing" principle of support of the United States armed services (see chapter XXI for further discussion of Lend-Lease and reverse Lend-Lease); and plans need to be made for such action, particularly in the NATO alliance. In World War II, such transfers were handled as reverse Lend-Lease and were, monetarily, purely a bookkeeping transaction.

The difficult aspect of division of supply among allies lies in the problem of effecting a wise distribution of items in which there is an over-all scarcity, either because of absolute shortage or shortage of shipping. Obviously the solution to this problem must be associated with a program for expanding available allied supply to assure that the more critical requirements are met. The nations involved can be categorized, on a commodity by commodity basis, as net producers and net consumers. Each nation usually has a surplus in one or more commodities and, hence, a basis for bargaining in connection with the honest differences that arise. The following paragraphs describe some of the factors to be kept in mind in seeking a solution to the problem.

In an emergency, the countries involved in supply of critical raw materials vary in their participation in the emergency effort from all-out war effort through lessening degrees of activity – perhaps to neutrals. In a condition of active formal hostilities, neutrals may refuse to participate in any allied arrangement for allocating scarce materials.

Transportation may not be important in an emergency short of war, but it is important and sometimes a controlling factor in war. The United States and its potential active allies control most of the world transportation and control the surface of the sea. Violations of allied understandings on distribution of materials can be checked and often thwarted completely by control of the sea. (Chapter XIX discusses navicerts.)

There is a relationship, from the allied standpoint, between dis-

tribution of scarce materials and the military production program of each country. This relationship has to be integrated into any allied distribution arrangement.

Any international system of division of a scarce commodity must be related to the materials allocation and rationing system within each country concerned, even as it is related to the availability of shipping in the case of bulk commodities. For example, the United States-British arrangements on food during World War II were related to the size of the British ration. If the United States and other food surplus areas had grown less food, we might have had to establish stricter rationing at home, in order to provide a minimum to allies. Furthermore, the materials allocation system within a country must take account of the essential needs of allies and provide administrative machinery to assure such allocation. The United States Foreign Economic Administration represented allies to the United States allocating agency in World War II. There was a similar representation in the partial mobilization after 1950.

An effective arrangement depends very heavily on honesty and on accurate forward estimates among participants. Each participant, in effect, looks into every other country's cupboard and also at its standards of living and its military production. Particular difficulties arise when one country is either a chief supplier or a chief user of an item. The United States is a chief supplier of food and several other items and a chief user of most scarce materials. There is a natural human feeling for producer countries to underestimate supply for fear their production will fall short and hence their own war effort and civilian economy will be in difficulties. There is also a natural human feeling to overestimate requirements, if only to give a bargaining position in discussions. As an example, the British, during World War II, at times had difficulty convincing the United States representatives that their proposed reserves of food and petroleum products to be held in Britain were actually necessary.

The above list of factors and considerations may seem too overwhelming to give hope of any possible arrangement for effective distribution. It is, however, true that eight countries, the United States, United Kingdom, France, Japan, Italy, Belgium, The Netherlands, and western Germany, effectively dominate the requirements for nearly all the essential materials for industry. Canada might be added to this list. The requirements of other countries, although im-

portant to them, are minor, quantitatively. Consequently, the problem is really more manageable than at first inspection.

Turning to a brief account of past experience, the United States, Britain, and Canada participated in a Combined Raw Materials Board during World War II. Its object was consultation, to secure all available raw materials (other than food), and to divide them skillfully, for maximum production. This Board worked in conjunction with a Combined Production and Resources Board in examining both estimated supplies and stated requirements. Such examination is not a matter for high level diplomatic bargaining and formal international agreements but, rather, a shirt-sleeved effort to approach allied understanding on the best distribution in support of a war effort. The fact that every participant is forced to explain and defend both his supply and his requirements situation serves to move the effort a long way toward agreement. Furthermore, in an allied war effort, no participant can afford to take an arbitrary and recalcitrant stand when the facts presented indicate that another nation may be critically weakened thereby.

After the outbreak of the Korean emergency, raw materials purchases by the United States (some of it by private individuals for speculation) caused prices to skyrocket. These inflated raw material prices produced the International Materials Conference (IMC), an international emergency agency which grew to include 28 nations, some of them primarily producers and some primarily consumers. The central group of the IMC, started by the United States, France, and Great Britain, grew to include Italy, Canada, Australia, Brazil, and India. The organization was set up to operate through commodity committees (that is, on a "commodity by commodity basis" as mentioned above). Nations were represented on a particular commodity committee if they were either a considerable exporter or a considerable importer of the item. The first were commodity committees for cotton and cotton linters, wool, pulp paper, copper, zinc and lead, manganese, nickel and cobalt, tungsten and molybdenum, and sulphur. The method of operation of these committees was to consider ways and means to attain a balance between supply and requirements to make recommendations to their respective governments. Obviously, this method of operation does not assure that a particular country will not try to obtain a greater share of the supply by out-bidding its associates,

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or that a producer country may not freeze its supply of a scarce material while demanding a higher price. However, there are diplomatic and other pressures which can be brought on the noncooperators.

In a free world depending on collective security, and with the distribution of raw materials so important in an emergency or war, it appears that forehanded allied preparedness measures must include arrangements for distribution of materials in NATO, The Organization of American States, and the Pacific Pact. Certainly such arrangements would quickly come into being in case of a major emergency.

Distribution to neutrals. Some may ask why we consider supply of neutrals. If such nations do not attain minimum essential materials, they may be driven toward the enemy. Furthermore, practically all nations have supplies or facilities which we need in an emergency. Hence, there is a necessity for some allocation to neutrals of scarce materials and of products made from scarce materials. These needs must be allowed for in any national or international allocations system. They would probably be minor in quantity and be linked closely with economic warfare activities (see chapter XIX).

RESTRICTING REQUIREMENTS FOR RAW MATERIALS

This section is concerned with emergency measures for reducing the requirements on basic production of the farm, mine, well, and sea. In general, the useful measures are applicable to some degree in peacetime. The emergency action demanded is largely an intensification of the peacetime program.

Substitution can be applied in at least two general ways. First, more plentiful materials can be substituted directly for scarce materials in particular products. The Germans, in World War II, excelled in this technique. To cite some examples, the copper in German locomotives was reduced from 2.3 metric tons to 237 kilograms. Copper in each German submarine was reduced from 56 to 26 tons. German motor vehicles used iron rather than copper radiators. More plentiful materials were substituted for less plentiful in gun tubes. The United States, in World War I, enforced an

interesting example of substitution in food. Purchasers of white wheat flour were required to purchase an equivalent amount of a substitute such as corn meal or rice. A second type of substitution can be achieved through standby designs which, although less desirable, utilize smaller amounts of scarce raw materials or depend on more plentiful ones. As an example, during World War II many European cars operated on gas from a generator either built in or towed behind them.

Synthetics can be classified as substitutes, although technological advance is gradually making them as effective as, or more effective than products formerly made of scarce materials. Plastics can be substituted for metal in many products. Synthetic rubber has already replaced natural rubber to a very considerable extent, although some crude natural rubber is necessary in its production. Synthetic gasoline enabled Germany to continue World War II long after she might have been prostrate. As another example, the United States used 275 million bushels of wheat, held as "surplus" prior to hostilities, in the production of synthetic rubber during World War II.

Conservation and reclamation. Conservation is accomplished by having less waste material in making a particular product, by having the product used longer without replacement, and, in case the product consumes materials in its operation (as does an airplane or ship), by getting maximum use with minimum consumption. An over-all program of conservation starts with the source of extraction and extends to the dinner table or the scrap heap. A few examples indicate the possibilities. Extraction of all the ore or other metal in the mining process is a fruitful source of conservation. The processes of industry involve some loss of materials through the shaping of metals and the processing of foods. A reduction in the accident rate of jeeps is a raw materials conservation measure as well as a manpower conservation measure. The transport of supplies and personnel by ship and rail rather than by air is usually a major conservation measure; at the minimum, it effects a major saving in fuel. The German practice in World War II of not using artillery fire on targets they considered unremunerative, whereas the United States artillery would fire at the same type of targets, is a contrast forced by the fact that German artillerymen usually had to conserve carefully their ammunition. Truck miles and flying hours allotted

to training may be determined in part by the need for conservation of materials.

The reclamation of used materials is an important source which can reduce the demands on agriculture and the extractive industries in time of emergency. The most familiar example is scrap steel. It is conceivable that the day might come when we would be forced to mine the battlefields for raw materials for reprocessing. The losses of materials and particularly scarce metals in the industrial process are considerable for some items and are a fruitful field for technology. The cost of such recovery might sometimes be uneconomical in peace, but it might not be controlling in war. The mining of slag heaps could become an important industry in an emergency.

Military requirements and standards of design. The military demand on materials, being the direct result of military requirements for forces and end items, is very dependent on the soundness of military judgment and accuracy in military estimates. To cite an example, if it is decided from a military standpoint that our next fighter airplane as compared to the last should have twice as much aluminum in it and that we should have twice as many fighters, the expansion and impact on materials is a geometrical one. It is not only the increase in aluminum. There is a corresponding increase in other scarce metals going into the engines, electronic system, and other parts of the plane. There is a major increase in consumption of fuel. There is a major increase in the metals devoted to spare parts which have to be produced and stocked. There is another major increase in materials because a large number of planes have to be stocked in reserve. Runways and flight decks may have to be strengthened. The chain reaction on materials is tremendous. Turning to a simpler example not involving design, the recommendation of the Army General Staff as to whether we ought to stock one, three, six, nine, or twelve months' supply of food or clothing in reserves may make a material difference in the short run on the available stock of renewable resources.

The United States has never had to consider very seriously the availability of materials, either in quantity or type, in preparing designs of military equipment or in estimating the feasibility of military requirements. The money cost may have been high, but that has been a secondary matter. Moreover, there are instances when

high cost has, in the end, paid off, the best example probably being the construction of the first atomic bomb. But in the future, it will be necessary to consider the absolute availability of materials in preparing designs and assessing the feasibility of requirements. The President's Materials Policy Commission expresses the view that "The military establishment, like the rest of the nation, faces the need to alter its practices in keeping with the nation's worsening materials position." The Commission recognized that the armed services are making efforts in this direction through measures such as standardization and uniform cataloging which serve to reduce requirements (see "Cataloging and Standardization," chapter XII). It did not suggest that any change be made which would have an adverse effect on preparedness in mobilization, but it did express its conviction that there are substantial possibilities for the armed services to reduce military materials requirements. In effect, the raw materials situation in the future demands that the armed services have a "materials consciousness" paralleling their "cost consciousness." In addition, it also demands a similar approach on the part of the civilian economy.

AGRICULTURE IN AN EMERGENCY

There are certain special conditions concerned with agriculture which should be mentioned in this discussion of the strategy of materials. These derive principally from three factors: (1) the peacetime relationships between government and the agricultural industry which tend to carry over into wartime, (2) the fact that the problems and requirements of war are made more difficult by the large number of farm "businesses," and (3) the size of the industry and consequent demand on both scarce materials and total resources to maintain it.

Some effects of peacetime government relationships. The peacetime public policy which guarantees the farmer a floor price on a large proportion of his products, coupled with the associated acreage allocation program, provide a possible mechanism for use in wartime to persuade expansion in the production of some commodities and contraction of production in less essential commodities. Through shifts in acreage, allocations for which prices are guaran-

teed, or by providing a low percentage of parity for some items and a high percentage for others, or by a combination of these measures it seems feasible to obtain *conversion* and *expansion* of agriculture similar to the industrial mobilization programs in manufacturing industry. It would, of course, be necessary to couple such measures with government action to assure machinery, fertilizer, and manpower. Furthermore, it would be necessary to establish price control and rationing of materials for which production has been reduced (tobacco might be an example).

There are obstacles to the possible emergency course of action just suggested. The first is precedent. During World War II, the government was unwilling to use the continuing peacetime stabilization measures as machinery for encouraging a shift in agriculture production. Yet logically, when the producer of a less essential item continues to have the price of his production guaranteed on a basis as favorable as the more essential items, he continues to produce the item to which he is accustomed. There is, of course, the possibility that all necessary expansion can be accomplished through persuasion and without leverage such as suggested above. Secondly, a large number of farmers, over the period of the last twenty years, have become adjusted to a particular type of agricultural policy. A major shift in this policy would cause hardships to some, even though the net result contributed to the war effort. It is true, however, that a great many businesses and a great many more individuals incur hardships in wartime in the interest of preserving the nation.

Large number of producers. Five million farm enterprises must be compared with the limited number of manufacturing and raw materials extracting enterprises in the country. There are probably a quarter of a million of the latter. Probably no more than twenty thousand contribute most of the war production. The large number of farm enterprises creates a tremendous administrative problem in the implementation of any agricultural mobilization policies. Hence, established peacetime government relationships of long standing need to be used to the utmost. These relationships exist, stemming from the Department of Agriculture through its large field organization. The Department of Agriculture estimates production goals and attempts to persuade their attainment; it acts as a representative of the farm industry in the government forum where

scarce and critical materials are allocated and, in so doing, pleads the case of the fertilizer industry, the farm machinery industry, and the distributors and processors of farm products. It has a major voice in the allocation of available supplies of farm products to meet requirements of the military, allies, industry, and civilian users. During World War II and since that time, it has served as the government purchasing agency for farm products for shipment to allies on Lend-Lease and similar assistance programs. Its Commodity Credit Corporation is already in the purchasing business, incident to operation of the peacetime farm stabilization measures.

Agricultural demands for scarce resources. In chapter XIII, we will discuss measures for assuring adequate materials, machinery, finance, manpower, and other resources to defense manufacturing industry. The same problems apply to the farm industry, with the added difficulty that we are dealing with over five million businesses rather than with a few tens of thousands that are important. In such circumstances, only blanket policies can be made workable unless a huge and undesirable administrative bureaucracy is provided. Under such a system of assistance and control some farms and farmers probably gain unduly, and a few suffer. The main point to be made, however, is the huge demand of the farm industry in an emergency for scarce materials and manufactured items. The importance of fertilizer for agriculture was recognized in the building of the industrial mobilization base after 1950. Tax amortization aid (see Chart VIII-1) was programmed to assist the expansion of nitrogen production by approximately 80 per cent over 1950 capacity. The great and continuing increase in use of machinery, power, fertilizer, and other components of our farm program means that these components must be maintained and replaced if production is to be sustained – even as in the case of manufacturing industry. Finally, the agricultural industry in peacetime suffers from sporadic labor shortages which would be intensified during war – unless the threat of atomic attack on industrial areas greatly increases the attractiveness of farming. Draft deferments can be used to keep labor on the farm, particularly if there is a favorable differential with manufacturing industry. If this differential is offered in pay instead of deferment, the result is inflationary; in fact, control of industrial wages, particularly the high overtime element, would be helpful in maintaining agricultural manpower. Finally, we might, under some circum-

stances, have to consider some form of national service for this and other selected industries – perhaps initially related to individuals rejected for mental and physical reasons and those deferred for dependency (see "National Service," chapter V).

SUMMARY

In designing our materials mobilization base, we must consider the chain of actions from extraction through transportation and processing, to distribution to users (discussed in chapter XIII) in accordance with national security priorities. The leadtimes are long in achieving improvement of supply of materials; consequently, "materials readiness" is an essential element of preparedness. There is no clear distinction between measures for needed expansion to supply peacetime needs, preparedness measures, and war measures, the difference being generally in degree of government assistance and direction. We have discussed the incentives and assistance which can be given to private industry. These measures do not differ from programs and policies for guiding and assisting manufacturing industry in an emergency.

Stockpiling is the accepted United States policy for meeting the surge of increased demand at the beginning of an emergency and for guarding against the hazard of being denied foreign sources of supply. Stockpiling is similar to putting money in the bank to guard against a future emergency. It also gives a *de facto* expansion of our labor force if that emergency comes.

Raw materials are one of our most complicated international problems in an emergency. They are almost certain to be in short supply and are as vital to our allies as to ourselves. International cooperation and allocation is therefore necessary.

On the demand side, an emergency necessitates controls to restrict civilian consumption (discussed in later chapters), substitution of more plentiful for scarce materials, conservation, and reclamation. A future emergency might see us restricting reserves of munitions and adjusting their design to save scarce materials.

Agriculture is an atomized industry which can best be mobilized through extension and adjustment of peacetime practices. Policies have to be generally applicable, rather than being applied on an in-

dividual firm-government relationship, as is possible for most mineral materials. The well-understood peacetime policies coupled with allocation of materials and equipment (fertilizer, farm machinery, etc.) lend themselves to persuading and compelling agricultural mobilization closely adjusted to war needs. Such action has not been necessary in past emergencies, however, and might be politically difficult.

TOPICS FOR DISCUSSION

1. Outline the procedure by which the government might determine how much aluminum would be needed in a future emergency. Then outline your program for balancing capabilities and requirements and for assuring an adequate supply for a long, full emergency beginning three years from now. (Note: Consider Charts II-1 and II-2 and discussion of power in chapter IX.)
2. Discuss the pros and cons of the following as raw materials security measures: (*a*) tariffs, (*b*) "Buy American" policy, (*c*) subsidies.
3. Under what circumstances would stockpiling be (*a*) a stabilizing influence, (*b*) an influence toward disequilibrium?
4. Discuss the statement: "The United States can consider itself essentially self-sufficient in wartime because of its capability to utilize low-grade ores, synthetics, and substitutes." Consider specific examples such as iron ore, aluminum, and wool.
5. What (*a*) preparedness, (*b*) wartime organization and policies would you propose to meet the problem of supply and distribution of materials among our allies?
6. Outline your program for mobilizing agricultural resources (including adequate support of agriculture with manpower, machinery, etc.) in case of a full emergency. How much does it compete with military needs?

SUGGESTIONS FOR ADDITIONAL READING

(In addition to those sources listed in chapter VII)

BRANNAN, CHARLES F., "Problems of Agricultural Production," *The Annals*, November 1951, CCLXXVIII, 119–25.

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MASON, EDWARD S., "American Security and Access to Raw Materials," *World Politics*. New Haven: Yale University Press, January 1949, Vol. I, No. 2, p. 147.

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———, MUNITIONS BOARD, *Stockpile Reports to Congress*. Washington: Government Printing Office. Published semi-annually in January and July.

ENERGY RESOURCES

I: Electric Power · The United States Power Industry · Electrical Power and World War II · Power in Mobilization Planning
II: Energy Resources. Coal, Petroleum, Natural Gas, Atomic Energy · Energy in Mobilization · Summary · Topics for Discussion.

Man's productivity has increased through history in proportion to his ability to use energy from sources other than his own muscles. (Author unknown.)

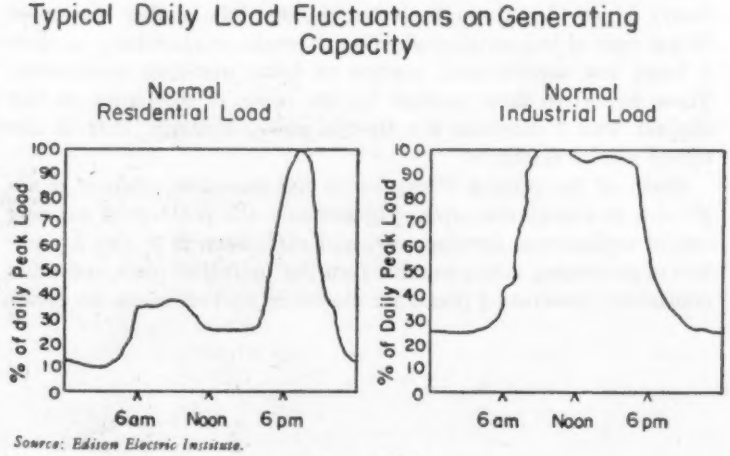
OUR ENERGY RESOURCES, with particular reference to preparedness and war mobilization, are the subject of discussion in this chapter. These resources are principally coal, gas, petroleum, and waterpower, with atomic energy a prospect in the future. A substantial proportion of the supply of each of these resources is consumed in secondary forms, that is, coal as coke, and all of them as electric power. In fact, over half our energy production is converted into electric power. Over 90 per cent of the power in industry is provided through electric motors. Put another way, over 90 per cent of industrial production depends on electricity, as does a large, but unestimated, portion of basic materials production. These important facts account for the order of discussion in this chapter. Part I discusses the electric power industry; Part II discusses energy resources.

Much of the general discussion in the preceding chapter is applicable to energy resources. For instance, the problem is not only one of exploration, development, and extraction. It is also a problem of processing into a suitable form for industrial users and other consumers: generating plants for electricity and refineries for petro-

leum; and it is a problem of transportation: transmission lines for electricity and tankers for oil. The general objective for energy resources is the same as stated for raw materials: the right amount, at the right place, at the right time, at lowest cost – the last point often being least important in war.

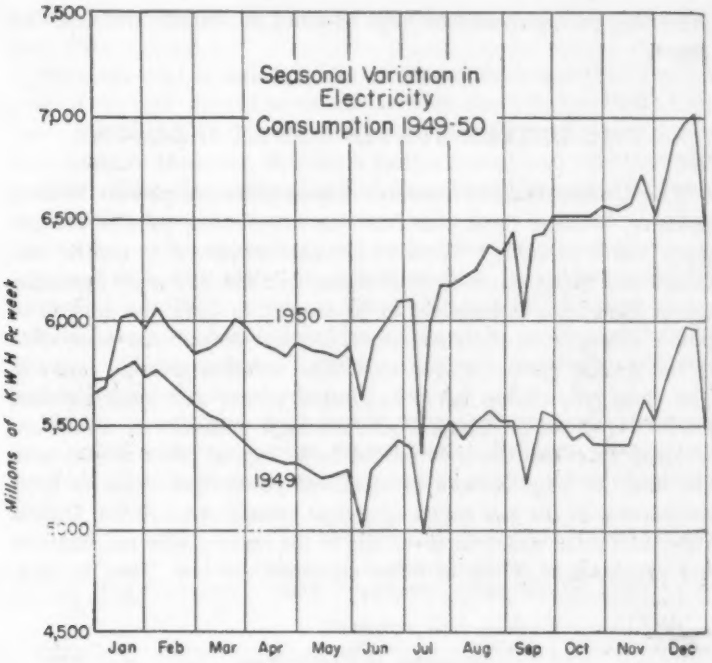
I: ELECTRIC POWER

Electric power has certain characteristics which should be kept in mind. Once produced, it cannot be stored in appreciable quantities. Yet the demands for power in our economy fluctuate over each 24-hour period and through every season. Charts IX-1 and IX-2 illustrate the necessity for a peak generating capacity materially above the normal daily and seasonal average of consumption. We will refer to the normal sustained requirement on any particular generating capacity as the *base load*. The total of this base load and additional fluctuating demands (for example, the evening home lighting and cooking load in many communities) will be called the *peak load*. There is, in effect, a built-in stockpile of electric power reserve in the normal peacetime economy, providing we are willing



Source: Edison Electric Institute.

Chart IX-1.



Source: Edison Electric Institute.

Chart IX-2.

to undertake measures, in an emergency, to utilize the peak load capacity and to restrict non-essential uses (that is, to raise the base load without increasing the peak load).

The outstanding characteristic of electric power is the efficiency and flexibility with which it may be transported from the generating source to the point of use in the factory or home. In four other characteristics, electric power resembles transportation: (1) It furnishes the same type of services in war as it supplies during a period of preparedness. (2) It is difficult to expand its capacity quickly. (3) It has flexibility of operation in an emergency. (4) As a public utility, it is regulated in peacetime, and emergency government controls are effective and easy to impose. The mobilization of power for war is discussed later in this chapter, but the immediately

preceding points should be kept in mind in reading the next few pages.

THE UNITED STATES POWER INDUSTRY

The United States economy's dependence on power. Modern industry, whether factory or farm, no longer uses man as the primary source of energy. Workers are now employed to control machines and guide parts through them, but the power of operation comes from some outside source of energy. In 1949, the amount of power available to each American factory worker was equivalent to the muscle power of 190 men. The trend is steadily upward. The close relationship between electric power and gross national product is shown in Chart IX-3. The high productivity of the individual American depends on the large capital plant available to him and the large amount of electrical power that operates it. A comparison of the per capita electrical consumption of the United States and other countries gives one of the reasons why productivity and standards of living in other countries are low. This, in turn,

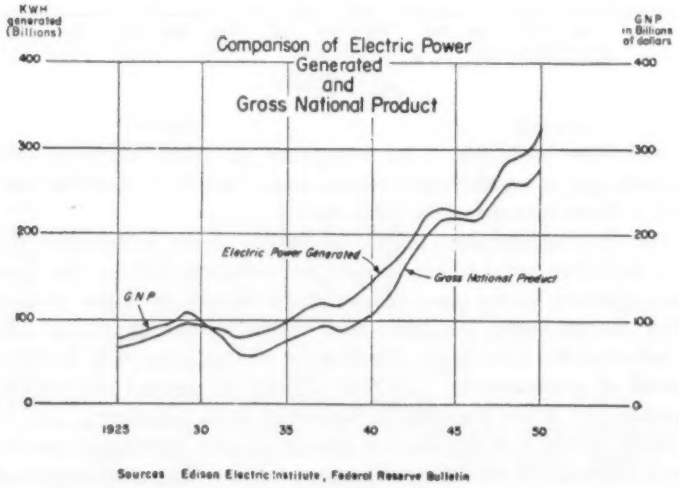


Chart IX-3.

limits their capacity to produce complicated modern weapons of war. (See Table 1.)

Although vital to industry, electric power costs less than one per cent of the cost of most products and only about 13 per cent of the cost of aluminum and magnesium, major consumers of power during mobilization. However, this small proportion of cost does not adequately reflect the problems of building electric capacity. The time required to expand power capacity varies from one and a half to four or five years, depending on whether new generating plants are operated by fuel or hydro power and whether the materials and the engineering skills required are scarce during a mobilization or war effort. Strong arguments exist for ensuring in peacetime the generating and transmission capacity that will guarantee adequate power for a major mobilization.

Hydro power and fuel power. These are generally mutually supporting sources of power. Depending on the type of load they are best suited to provide, and their energy source, power plants can

TABLE 1

PRODUCTION OF ELECTRIC ENERGY
PER CAPITA IN VARIOUS COUNTRIES OF THE WORLD, 1950

	Population (millions)	*Kwh produced (billions)*	*Kwh per capita*
Canada	14	57	4,083
China	456	2*	4
France	42	35	828
Western Germany	48	44	923
India	358	5	14
Norway	3.2	15.1	4,696
Pakistan	75	.13	2
United Kingdom	51	55	1,085
United States	152	388	2,557
U.S.S.R. (est.)	203	90	443

*1948

Source: Adapted from Edison Electric Institute and (for USSR population) Table 1, chapter VII.

be divided into four groups: (1) fuel base load plants, with large turbo-generators designed to supply a sustained daily demand; (2) fuel peak load plants, usually consisting of smaller fuel units; (3) hydro base load plants, such as the one at Niagara Falls; and (4) hydro peak load plants, where there is insufficient water or insuf-

ficient head, or both, to support large continuous flow. The most economic production of power results from judicious interconnection and integrated operation of different types of power plants.

The cost factor is the primary determinant in choosing between hydro and fuel power and conditions determine which one has a cost advantage in any area. There are two main components of costs: operating costs and fixed costs. Fuel expense usually makes operating costs for fuel power higher. On the other hand, fixed costs are almost always higher for hydro power because of the large initial investment in reservoirs and dam construction. Furthermore, with rare exceptions, (Niagara Falls, for example) hydro plants are not suitable for 24-hour-a-day, year-round operation at capacity because of seasonal variations in water flow conditions. Although the Niagara generating capacity is ideal to carry a base load, the daily peaks require additional fuel generating capacity. There are no suitable hydro power sites in some areas of the country. The United States is fortunate in having two-fifths of its remaining hydro potential in the Columbia river system, a power short area where transportation costs make fuel expensive. The two areas where base load, around the clock, hydro power plants are likely to be economical are in the St. Lawrence Waterway project [1] and additional capacity at Niagara.

Between 1920 and 1950 the ratio between hydro power and fuel power capacity stayed about the same, hydro power comprising 26 to 29 per cent of the total capacity. It appears likely, however, that in the future, the rate of growth of fuel power will exceed that of hydro power because of the large expansion required to furnish energy for our growing economy and because of our limited hydro sites.

The efficiency of generating units in the consumption of fuel is being continually improved by technology and is an important element in power costs. The most modern fuel plants use only three-fourths of a pound of coal per kilowatt hour (kwh) compared to ten pounds used in Thomas Edison's Pearl Street Station in 1882. In recent years, however, improvements in thermal efficiencies have not been able to offset the rising cost of coal. The fuel cost per kwh actually increased 50 per cent between 1940 and 1950. Hydro power costs also have increased, primarily because of construction costs.

[1] President's Materials Policy Commission, *Resources for Freedom*, I, 119.

Power reserves. Electric generating systems have two types of reserves: maintenance reserves and spinning reserve. The maintenance reserve consists of idle standby units, generally used only when regular units must be stopped for repairs. The spinning reserve is the excess capacity, over the load being furnished, of the generating units actually in use, that is, the spaces above the load lines in Chart IX-1. Both types of reserves can be used to produce power in wartime; maintenance reserves can be reduced by careful scheduling of shutdown periods, and spinning reserve requirements can be reduced by better round-the-clock use of electric power.

Before 1935, the public utility systems of the country never had less than a 50 per cent reserve margin. During World War II, reserve margins varied between 20 and 26 per cent. They dropped to below 12 per cent in the postwar years (Table 2). The high reserve margins before 1935 were the result of two factors: (1) as a rule, each ownership unit operated on the principle of self-sufficiency, providing its full reserve requirements of generating capacity to carry peak loads and provide for shutdowns; (2) although there were some limited capacity interconnections between systems, no regions were tied together for large-scale transfers of power. Large capacity interconnections were a World War II development. With the interconnections in existence in the 1950's and the high level of industrial activity of the remobilization period, most power men believe that a 15 per cent reserve is a suitable goal to build to. It is interesting to note that more electric power (kwh) was generated in 1944 than 1946, although there was a 4.3 million kw smaller peak load capacity in 1944. This indicates that, in an emergency, the United States can use its generating capacity more effectively than it normally does.

Interconnections. Interconnections have made possible more efficient use of existing generating capacity. They could also provide a major element of power security if the United States is subjected to direct attack.

During the summer of 1941, a serious power shortage developed in the southeastern United States. Following recommendations by the Federal Power Commission (FPC), electric systems operating in adjacent areas voluntarily cooperated to furnish power to the deficient areas. Confidence and know-how were obtained from this experience. For the first time, many problems of operation, pre-

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viously considered as limitations on region-wide pooling of power, were tackled and satisfactorily solved. The fact that we had standardized on 60-cycle alternating current facilitated this pooling of generating capacity. It remained only to standardize on transmission voltages and metering and switchgear devices. Once the technical difficulties were overcome, we began to realize the advantages of generating systems serving combined rather than separate system loads. Interconnections, at smaller installation costs in resources, enabled us to use hitherto unavailable reserve generating capacity. This action was equivalent to a major expansion in power generating capacity in World War II. The continued use of interconnections after World War II reduced our need for large reserves in normal times. It also removed the possibility of having extensive, reserve generating capacity on the pre-World War II scale to use in future emergencies.

In summary, the benefits from effective interconnections are as follows:

1. Lower reserve requirements, resulting in higher load factors and lower fixed costs
2. Greater diversity of demand, leveling out peaks among systems
3. In the case of hydro power, leveling out the effects of drought and differences in water supply
4. Greater assurance of power for essential users if our power system is subjected to enemy bombing or sabotage

Transmission distance limits. The usefulness of interconnections and of hydro power sites is limited by the distance electricity can be efficiently transmitted. Generally, electrical energy can be transmitted efficiently about 1 mile for every 1000 volts of pressure. Commercial voltages have increased from 11,000 volts in 1890 to 287,000 in 1935 and to the experimental use of 500,000 in 1952. There is a line loss in transmission; and as a practical matter, the generating company and industrial user try to keep transmission distances to a minimum. The average distance traveled by electricity in the United States is less than 25 miles. In the early 1950's, the longest United States transmission line (285 miles) was from Hoover (Boulder) Dam to Los Angeles. In an emergency, electricity can be transmitted greater distances by what is known as

"displacement of power," transmitting power from one source into the area of another source, thus permitting the second source to transmit its power to the far end of its radius of transmission. But the efficiency of such practice is low. There are important economic problems, such as whether fuel should be transported to fuel power plants or should fuel plants be located at fuel extraction sources (at the mouths of the mines), whether industry should move to power or power be transmitted to industry. These problems are beyond the scope of this text, but they have a bearing on the dispersion of industry in an atomic age.

Transmission distance seems certain to increase. The meaning of 300-mile versus 500-mile transmission distances in the economics of power and in the development of emergency measures is indicated by a simple exercise in plane geometry. A circle with a 300-mile radius covers approximately 1/7 of the United States; a circle with a 500-mile radius covers more than 1/5 of the United States. As transmission distances increase, generators can be located near sources of cheap fuel rather than near load centers. Some hydro power sites may become more economically feasible. If power costs less and can be transmitted farther, the location of defense industries can be determined by strategic reasons rather than the proximity of sources of power. Finally, in case of atomic attack or similar disaster, emergency power can be transmitted to afflicted areas from more distant sources.

The electrical equipment industry. Our industries are dependent not only on generating capacity and on transmission lines for sustained and increasing productivity from electric power, but also on the electrical equipment industry. This industry makes the power generating equipment which replaces obsolete equipment, provides the motors and electrical controls needed for industrial plant expansion, and provides products such as toasters, washing machines, etc., that use the electrical power. As a rule of thumb, an average of ten dollars' worth of equipment is needed to use the electricity produced by one dollar's worth of generating and transmitting equipment. From 1920 to 1950 the generating capacity in the United States increased by 440 per cent, whereas the power consumption increased by 735 per cent. The differences in the two increases resulted, in great part, from the improved efficiency brought about by consolidation of individual generating properties and the inter-

connections discussed above. The effect has been a greater demand for the equipment that uses electricity than for the equipment that generates it. Generally, both types of equipment are manufactured by the same company. There is also a large foreign demand for United States' electrical equipment. The continual health of this industry is important from a security standpoint, because part of its civilian goods production is needed to sustain a war effort and because the industry is readily converted to making other defense items, such as electrical equipment for naval vessels, aircraft, and tanks.

Reserve margins and power shortages. The reserve margins of generating capacity dropped to 7 per cent in 1950 rather than the 15 per cent considered a safe minimum. Some regions had serious power shortages. One shortage during this period affected aluminum producers (it takes 10 kwh of electricity to produce 1 pound of aluminum) and slowed down our rate of aluminum stockpiling – which, in one sense, is an electricity stockpile. The methods used in dealing with power shortages in peacetime indicate substantially the methods applicable to wartime shortages. For example, 1947 drought conditions in northeastern Maine made it necessary for industries to work during off-peak hours and at night. It was even necessary to limit the general public to two hours use of electricity out of four (a common practice in Europe during periods of power shortage). Other possible measures are appeals to the public to avoid using heating appliances during the peak hours and the banning of unnecessary illumination.

Trend of energy production, capacity, and peak loads in the United States is shown in Table 2 giving the growth since 1925.

Private enterprise in the early 1950's produced about 85 per cent of electric power; private utilities produced 70 per cent and industrial concerns produced 15 per cent for their own consumption. The government produced the remainder. More often than not, the power industry has been conservative in estimating requirements for the future. There are reasons that justify this past conservatism. They include the depression experience, the threat of government competition, and the record of difficulties between private industry and government in the 1930's. Some results of this conservatism were the power shortages and low reserve margins after World War II. The partial mobilization initiated in 1950 ob-

TABLE 2

GENERATION OF ELECTRICITY AND PEAK LOADS OF PUBLIC UTILITIES — SELECTED YEARS FROM 1925 - 1952*

Year	*Generating capacity (millions kw)*	*Noncoincident peak loads (millions kw)*	*Reserve margin (% of peak)*	*Electricity generated (billions kwh)*
Prewar				
1925	21.5	14.1	52	61.5
1932	34.4	18.2	89	79.4
1939	38.9	26.7	35	127.6
World War II				
1942	45.1	35.9	26	186.0
1944	49.2	40.7	21	228.2
1945	50.1	39.5	27	222.5
Post-World War II				
1946	50.3	45.0	12	223.2
1948	56.6	53.8	5	282.7
1950	68.5	64.3	7	329.0
1952	82.1	75.4	7	398.9

* Does not include power generated by private utility plants owned and operated by industry, about 15 per cent of 1950 total U.S. capacity.
Source: Edison Electric Institute.

viously had to include another major power expansion to (1) permit rearmament production to go forward without undue restrictions on civilian use of electricity and (2) provide an adequate power mobilization base in case of greater emergency. The advance of military technology has increased the requirements for electricity to produce materials and weapons. Magnesium, aluminum, and atomic materials are critical defense materials that require large amounts of electricity. But before discussing power readiness, we will discuss our experience in World War II.

ELECTRICAL POWER AND WORLD WAR II

We must remember that since 1940 we have greatly increased our comprehension of economic preparedness and economic mobilization measures. Yet there are lessons to be learned from a study of industrial mobilization history.

Security power planning before and during World War II. It appears that the relationship of the power industry to industrial mobilization planning was not widely recognized until the Power

Act of 1935. After passage of this act, the Federal Power Commission (FPC), which had been making power surveys for public works projects designed to relieve unemployment during the depression, extended its investigations to consider the availability of power for national defense production. Early in 1938 the FPC was authorized to order interconnections and interchange of power that might be required for war. Also in 1938, private enterprise was reluctant to build more generating capacity for three reasons: (1) There was a 50 per cent reserve margin over peak loads. (2) They were thinking in terms of existing manufacturing plant capacity, because (3) industrial mobilization plans were surrounded by secrecy. However, private enterprise did place the orders with the electrical equipment industry which got production under way and made possible a 12 per cent expansion of generating capacity by 1941. When the power problem was integrated with other pre-World War II industrial planning, FPC surveys showed that the power supply in northeast United States was insufficient to support the munitions production initially proposed for that area. Practically the whole war production load had been allocated to fifteen industrial centers. Thirteen of them were in the Northeast.

The top mobilization control agency – the War Production Board and later the Office of War Mobilization – included an Office of War Utilities, largely manned by officials from the utilities industry. Vital power questions were asked and answered at the same time as expansion and conversion of war industries was planned. In November 1942, a survey was made of 25,000 industrial plants covering 80 per cent of the total industrial power load. This survey, for the first time, gave the public utilities a comprehensive basis for load system studies, including the extent to which they might rely on their neighbors for assistance through interconnections. It disclosed that 72 per cent of the industrial power load was for processing materials such as aluminum, magnesium, copper, and alloy steels. Further investigation in 1943 showed that the supply of critical materials, not availability of power, would limit defense production.

Although a great deal of credit should be given to the pre-hostilities planning and preparations, part of the World War II generating capacity put to emergency use was an accident, from the security standpoint. The large hydroelectric projects, Grand Coulee, Bonne-

ville, and the Tennessee Valley, started in the depression of the 1930's, were nearing completion at the beginning of the war. These plants enabled us to mobilize large unallocated quantities of electric power for aluminum, light metals, and electro-chemical production and to provide power for the atomic energy program. Our atomic energy time schedule might not have been possible if these hydroelectric plants had not been started prior to the war. It is significant that one of the main reasons given by the Germans for abandoning their atomic energy project was inability to mobilize the necessary power in addition to their other war production needs, even though there was no organized bombing of German power capacity. Even the best of planners cannot be expected to forsee all emergency power requirements.

Meeting the World War II power demand. In spite of the construction of some new generating capacity, the nation's over-all reserves dropped from 50 per cent in 1938 to 21 per cent in 1944 (Table 2). These over-all figures do not, however, give a true picture of the problems. Because electric power is a regional matter, the problem was to balance power requirements and capacities within regions. As discussed above, the development of interconnections helped materially. Many old and relatively inefficient generating units were brought into operation. Another complication was that the requirements of the Navy and the Maritime Commission for ships' turbines and generators competed with public utilities for production from electrical equipment manufacturers. Table 2 shows how little the public utility companies got from 1942 to 1945, when they had to share materials and equipment with other claimants who were in more direct support of the war effort. The Federal Power Commission and the War Production Board had to approve all requests for new generating capacity.

Construction of new generating capacity and interconnections are essentially peacetime measures, and the World War II activity in these areas might, with adequate foresight, have been accomplished prior to 1941. The truly emergency measures fall roughly into two classes: (1) those maximizing utilization; and (2) those restricting consumption of electricity. Better utilization was achieved by staggering starting times and operating industries around the clock. Restriction of demand was sought through using daylight saving time for the entire year and through banning unnecessary

lighting such as advertising signs and shop window illumination. The amount of power saved by these measures will be small, proportionately, because half the electric power generated is used in industry, and a considerable portion of the remainder is used in support of an emergency effort. But this saving may furnish an essential increment for industry, and the program has an important psychological effect on the public. Chart IX-2 illustrates the possibilities of conservation measures. Any saving of electricity also conserves the energy source consumed in generating electric power: coal, oil, or gas.

POWER IN MOBILIZATION PLANNING

Power demands in a major emergency. The factors to be considered in planning power for a future emergency include the time required to construct power generating capacity, geographical dispersion to support the industrial mobilization, the great increase in demand of certain industries, and the possibility of damage from enemy attack.

Fuel electric plants take from one and one-half to two years to build. Hydroelectric plants take four or more years depending on the size of the power installation, the reservoir and dam construction, and the engineering effort that must go into the design of the project. The minimum of one and one-half years for a fuel power plant assumes the use of standard generating equipment, mass produced by an electrical equipment manufacturer. The point is that construction of generating capacity often needs to start ahead of construction or corresponding industrial capacity (which frequently can be constructed in nine months or less). Thus, power planning should precede, or at least accompany, industrial expansion.

Geographical dispersion of industry, which includes the geographical dispersion of power, is discussed in chapter XI. It seems probable that in any future emergency, the great increase in demand in a particular area will arise from the expansion of the same basic industries (magnesium, aluminum, the electro-chemical industry, and atomic energy) which consumed most of the industrial power in World War II. Sound power mobilization planning should readily avoid the pre-World War II error of scheduling production in locations with inadequate power (Chart II-1).

The aluminum industry's power problem illustrates another facet of power planning for defense. The aluminum industry's power problems can be roughly classified as cost in peacetime and availability of supply in wartime. In the middle of World War II (1943), 12 per cent of all power generated in the United States went into the production of aluminum. In the mobilization of the 1950's, aluminum production was projected at a yearly rate of 3½ billion pounds a year. It takes 10 kwh to produce 1 pound of aluminum. In peacetime, the aluminum industry seeks low cost power, as it enjoys for its developments in the Northwest and Southeast, and locates its processing plants there. As these areas develop industrially, they attract new industries that need a smaller proportion of power per dollar of product and are willing to pay higher rates. The aluminum industry finds it difficult not only to expand in an emergency but also to keep the power it has in peacetime. The aluminum industry is thus pressed toward low cost power sites outside the United States, preferably near bauxite deposits. From a national security standpoint, we should examine this tendency, assess its impact on industrial mobilization, and possibly, through government action, reserve large blocks of low cost power (perhaps from government hydroelectric projects) for use by the chemical, light metal, and atomic industries in an emergency. This need for low cost power may be a continuing problem closely related to maintaining the basic industries built in the early 1950's for the industrial mobilization base.

Attack on United States power in war. One of the factors in power mobilization planning is the possibility of attack by bombs and sabotage on power generating sources and transmission lines. We must expect damaging interruption of power supply and the loss of some generating plants in case of a direct attack on our country. Measures for minimizing damage due to enemy attack are: dispersion of generating plants, construction of interconnections, development of long distance transmission capabilities, stockpiling transformers and other electrical equipment to replace or repair damage, and arrangements for concentrating skilled manpower to restore electric service to stricken areas.

The power mobilization base. The problem of building an adequate power mobilization base is typical of the mobilization prob-

lems of those industries which provide the same product in war as in peace, but must provide it in increased quantities. Standby munitions capacity requires adjustments with changing military requirements, but it is relatively static after it is built. Civilian goods production requirements are doubly dynamic, expanding with our generally expanding economy as well as shifting with changing military requirements. Thus the power problem is to (1) build the required reserve capacity as part of the mobilization base, (2) achieve expansion for normal peacetime needs while maintaining the reserve, and (3) expand the reserve in step with peacetime expansion. To cite an example, using approximate figures: a fairly safe reserve of 15 per cent, on top of a peacetime full employment requirement of 70 million kw capacity, is 10.5 million kw. But when the peacetime requirement expands to 120 million kw, the reserve needed becomes 18 million kw, assuming that 15 per cent still remains the desired reserve. And, from the beginning, there is bound to be a tendency for private industry to scrap some of the older, higher cost capacity, whether it be electric power production, petroleum refining, or for some other product and to utilize new facilities to full capacity. The maintenance of the power mobilization base, once constructed, is bound to be a continual struggle to keep a war reserve of capacity built ahead of the normal, and expanding, peacetime requirements. A continuing subsidy may be needed. Perhaps the tax amortization privileges (see Chart VIII-1) if continued, will be a sufficient incentive to private power companies to build new capacity ahead of expanding normal needs.

The requirements for the mobilization base are, as indicated above, the normal peacetime requirement plus a reserve. At the beginning of the partial mobilization of the 1950's, it was estimated that to provide for expansion and to restore a 15 per cent reserve, generating capacity needed to be expanded about 70 per cent in the five years after 1950. Tax amortization privileges and favorable priorities on scarce materials were provided as incentives. But this expansion, initially over 10 per cent per year, will have to continue for many years at nearly the same rate if needs are to be met. The Report of the President's Materials Policy Commission (PMPC) estimates that 1975 will show a requirement 260 per cent above that of 1950.

II: ENERGY RESOURCES

The principal primary energy resources are coal, petroleum, natural gas, and water or hydro power. We have sufficient of these energy resources for the forseeable future, since we have abundant coal. Economic atomic energy is for the future, perhaps the near future; and economically feasible solar and tidal energy are probable for the next generation. The principal energy resources are interchangeable to a high degree, except that motor and air transportation are closely tied to liquid fuels. The decision to change energy sources usually turns on relative costs, and the act of changing requires time and resources for new utilization equipment; for example, new furnace equipment is needed to shift from gas to coal heating. It is desirable to minimize changeovers in an emergency. The primary energy forms can be converted to secondary forms, such as electricity, coke, and liquid fuels, for more convenient use, although the conversion processes themselves consume energy. Chart IX-4 shows the shifting pattern of the energy mix in the United States from 1900-1950. It should be studied with the thought that as oil and natural gas costs rise when their reserves decline, coal use will probably start to increase proportionately; and waterpower, which is a small but important portion, will also increase quantitively although perhaps not proportionately.

The following discussion considers some of the mobilization aspects of coal, petroleum, natural gas, and atomic energy; waterpower is not mentioned again since it was discussed above.

COAL

Domestic situation. The United States' coal and lower grade solid fuels, such as lignite, make up more than 90 per cent of our total fuel reserves and about 40 per cent of the world's solid fuel reserve. Only 2.5 per cent of our recoverable solid fuel reserves had been mined by 1950. The quantity of coal consumed has remained relatively constant for several decades, and coal has supplied a steadily declining proportion of United States energy requirements. (See Chart IX-4.) But as other fuels become increasingly scarce their costs will rise, and we can expect a reversal in this trend.

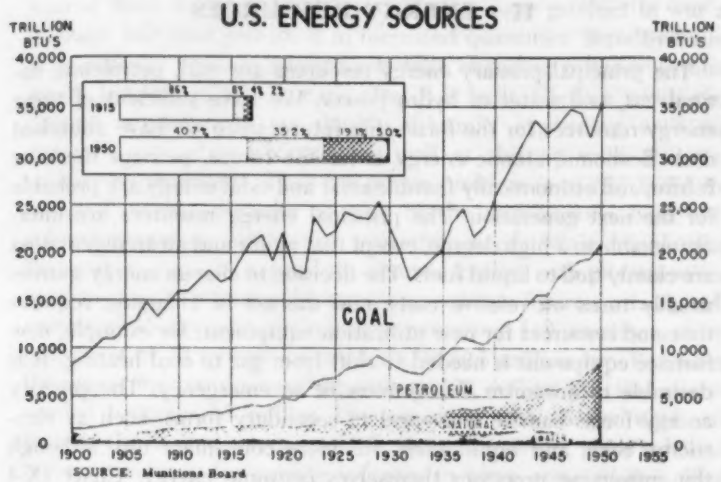

Chart IX-4.

The coal industry is made up of many comparatively small producers. Their generally small size and lack of financial strength have made the industry backward in technology of extraction, transportation, and utilization. Yet the United States coal industry is more efficient than its foreign counterpart. The thick coal seams, the large capital plant, and technical ability of American miners, give them about five times the productivity of British miners. The PMPC has strongly recommended that the federal government undertake jointly with the producers a program of coal research and development. The future may bring oil from coal, gas from coal, and reduced costs of electric power from coal.

Foreign situation. The maintenance and expansion of industrialization in the free world is very dependent on coal. Western European recovery after World War II was hampered by the inability of these countries to mine enough coal to provide for the needs of that area. Even in the early 1950's some United States assistance was going to Western Europe in the form of coal – at a cost of over $25 a ton, half of it being for transportation. The coal problem of Western Europe is lack of manpower, inadequate equipment, poor seams, depletion, and outmoded technology. Coal shortages add to the problems of international trade and foreign exchange. There have

been attempts, only partially successful, to alleviate the shortage of miners by emigration of Italian workers to England and France. The international exchange problem has been assaulted through the Schuman Plan which aims to eliminate the barriers to iron and coal among the six continental Western European countries. The logical source for coal imports into Western Europe is Poland. But this source raises the East-West trade problem which is discussed in chapters XIX and XX. In summary, coal is an important part of the program of rearmament and economic health of the free world, and will probably continue to be a problem for some time.

PETROLEUM

Petroleum supply has four main components: proven reserves in the ground, refineries, transportation, and storage facilities. Although we have been finding new reserves faster than we have been using them, our domestic consumption has exceeded domestic production. Since 1947, the United States has been a net importer of oil. While there are differences of opinion concerning *when* the depletion of our domestic reserves will have serious effects, there is strong agreement that this time will surely arrive. Already real costs show a long-term upward trend that probably cannot be reversed, due to a higher ratio of dry holes to strikes, deeper wells, and smaller size of pools discovered. For our preparedness economy, it is important that money costs stay low to encourage economic expansion. In an emergency, supply must be assured, with money costs secondary except that they are a measure of the resources that must be diverted from other emergency needs.

Two principal measures for keeping crude oil costs down, that is, increasing supply as demand rises, are: (1) imports, and (2) oil from domestic coal and shales. The largest of the free-world oil reserves are in the Middle East. There are other large reserves in Canada and Latin America. Due to favorable geological structure the cost of extraction in the Middle East is only a small fraction of the cost in the United States. A Middle Eastern well will produce at a rate several hundred times that of the average American well. Logically, the expanding demands of western Europe should be met from the Middle East, but there are political hazards within

the Middle East, and certainly the long transportation route may be interrupted in war. The sources in Latin America are more secure but their supply line is also vulnerable to submarine attack.

Turning to production of oil from coal and shale, we discover that this is technically feasible, but it is a matter of cost and construction of plants. We have huge shale deposits near Rifle, Colorado (about 20 per cent of our known oil shale) containing three times our 1951 proven oil reserves. The 1951 cost for delivering to Los Angeles gasoline produced from shale was estimated at 14.7 cents a gallon, compared to the 1951 cost of 12.7 cents for gasoline from wells.

Petroleum mobilization preparedness requires the same type of measures as are required to fill our expanding peacetime demand and, in addition, certain special measures directed entirely to preparedness.

Exploration and the drilling of wells in the United States need to be pressed. About 50,000 wells were drilled in the United States in 1952, compared to 6,000 in the remainder of the free world. It is interesting to note that the effect of drilling 50,000 wells in the United States was estimated to increase production from 7 million to 7.4 million barrels a day, whereas the much smaller number of wells drilled in the remainder of the free world was estimated to increase production from 4.9 million to 5.5 million barrels per day. Our expanded drilling program was discovering more oil per year than was being extracted; but, in comparison to the remainder of the world, we were depleting our reserves more rapidly. Construction of refinery capacity needs to be expanded and kept above expanding peacetime requirements, to provide an emergency reserve. Transportation facilities and storage capacity need to be provided on the same principle. Here we meet a difficulty in pipelines which handle a large portion of the petroleum ton-miles within the United States. Pipelines (discussed in chapter X) are not economical unless operated near full capacity. Pipeline capacity can not economically be held in reserve for an emergency. The partial mobilization target, with the objective of providing an adequate mobilization base of refining capacity, was 20 per cent expansion in the four years after 1950. The government incentives to persuade private enterprise to undertake expansion of the petroleum industry are the same as those applied to expansion of power and to mobilization of the machine tool industry (Chart VIII-1 and chapter XI). And the problems of

maintaining the mobilization base above the increasing demands of the civilian economy are much the same as those pointed out in the discussion of power mobilization.

The oil production chain, from drilling machinery and oil well casing through refinery, pipeline construction, and tankers, requires large quantities of resources. Material requirements, particularly steel, and production facilities for expanding oil output compete directly with requirements for the munitions industry. Furthermore, there is a long leadtime in bringing any part of the oil production chain into operation. In addition, war brings an immediate increase in petroleum requirements. A difficult planning problem requiring the integration of factors such as the sudden increase in demand for petroleum by ships, planes, and other military consumers, the expanded demand of petroleum users in industry, the restriction, if any, which will be placed on civilian consumers, the availability of foreign sources of petroleum, the availability of foreign refining capacity, and the percentage of losses of tankers. A fragment of our experience in World War II emphasizes the complexity. German submarine attacks interrupted the movement of oil by tankers from Texas to the East Coast. Tanker losses were severe, and this type of ship became one of the bottlenecks of military operations. The United States solved the transportation problem by running special trains from the oil fields to East Coast consumers, by construction of the Big Inch and Little Big Inch pipelines, and by rationing of gasoline. In fact, rationing was necessary only in the eastern United States but was carried out throughout the entire country to avoid a feeling of inequity. It was continued to save rubber after the oil transportation problem was solved.

Although the United States had an oil scare in 1942, there was not really a shortage during World War II, except that there were difficulties in transporting oil to the operational areas. In another emergency, we should anticipate major difficulties because of our worsened supply situation, our increased civilian and industrial demand, the greatly increased military requirement, and the possible destruction of tankers and even of refineries. We also have to consider the supply of allies who lack domestic resources and may have their foreign sources of supply partially or wholly interrupted. It seems only reasonable to plan on the basis that a major emergency

would create a sudden, and probably wide, gap between requirements and current supply for the United States and other free nations alike, particularly for naval and specialized aviation fuels.

In another emergency we should plan on much more severe rationing than in the last war. Even though a conventional stockpile is not possible, it does seem prudent to earmark an underground stockpile of proven oil deposits as a reserve for a major emergency. The PMPC recommends such a stockpile and suggests that the most feasible way to provide it is to develop the offshore oil of the Gulf Coast while restricting production, so that a reserve is available for quick expansion of production. In the previous chapter, we listed the elimination of tariffs on materials for which we wish to conserve United States supply. The 5 per cent import duty on crude oil needs re-examination. Finally, a government pilot plant such as the one operated by the Bureau of Mines at Rifle, Colorado for extraction of oil from shale is a needed preparedness investment. It would help to furnish the "know how" in this type of operation that could prove important in an extended emergency.

NATURAL GAS

Natural gas is an energy resource with a rapidly expanding use. The total consumption was almost tripled between 1930 and 1950. About three-quarters of the gas marketed in 1950 was consumed by industry and about one-quarter by household and similar customers who were willing to pay a higher price than the cost of other fuels. Because of the conveniences of gas, there is a rising demand for this energy source, and it appears unlikely that the supply will ever balance the demand at prices which are competitive to other fuels. Not in this decade, but certainly before the end of the century, our natural gas reserves will be badly depleted, and major substitution of another form of energy must take place. The problems in an emergency are essentially the same as those in peacetime. One unusual emergency problem is the increased vulnerability to enemy attack of built-up areas which are served by gas, rather than coal or oil, for heating and cooking. Special civilian defense measures will have to provide relief if gas service to these areas is interrupted.

ATOMIC ENERGY

Atomic energy, rather than providing energy, was actually using about 2.5 per cent of the installed power capacity of the U. S. in mid-1953. The atomic energy industry, a government monopoly procuring and processing uranium – and perhaps other suitable minerals – must have large amounts of continuous uninterrupted power. The United States Atomic Energy Commission has the tasks of finding uranium ores (which, incidentally, are not as scarce in the earth's crust as gold, silver, mercury, and some other minerals) of mining, procuring, transporting, and processing them into usable fissionable materials. The State Department helps by making political arrangements with foreign governments who have uranium deposits. The publicly known main sources are outside the United States, in Canada, the Belgian Congo, South Africa, and Australia. There are known low grade ores in Colorado.

The use of atomic energy for commercial purposes is for the future. It might someday solve part of the problems created by our worsening petroleum and gas situation. It is technically feasible to use atomic energy. Atomic-powered submarines, airplanes, and ships have been under construction at an unknown, but certainly fantastic, cost. The advance of atomic technology should gradually cheapen atomic power; but for the immediate future atomic energy seems certain to remain primarily a military resource with its principal use as an explosive.

The known uranium in the world has much less energy content than the known coal deposits. Furthermore, the development of atomic power "would probably slice off no more than 25 per cent from your monthly electric bill," says R. E. Lapp in his book, *The New Force*. Atomic power will be very much like hydro power in its cost, a matter of large fixed costs for generating plant and transmission, even though raw fuel cost is comparatively low. Dr. Lapp sees atomic power as of particular use (1) in areas far distant from hydroelectric power and present energy-producing fuels, and (2) for metallurgy and other processes having a constant demand for power and not requiring a costly transmission network. Atomic power may perhaps become an increasing commercial reality as gas and petroleum are depleted, thereby postponing the world's

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dependence on coal. Certainly an atomic power industry would be a welcome element of the mobilization base, particularly for a nation deficient in other energy-producing resources.

ENERGY IN MOBILIZATION

A major emergency in the 1950's will utilize approximately the same energy sources as World War II. We would be primarily dependent on those resources in being or available within a reasonable time after the beginning of the emergency. The preceding pages have, under each type of energy, suggested various preparedness and emergency measures in addition to the peacetime program for expansion to meet normal peacetime needs. Some of these suggestions are included in the following summary of seemingly desirable security measures.

1. On the supply side:
   a) Repeal of petroleum import duties in order to encourage use of foreign oil and conserve our own
   b) Setting aside an underground reserve of oil for emergency use
   c) Pilot plant construction, operation, and research for extraction of oil from shale
   d) Government aid to develop the technology of coal extraction and uses
   e) An adequate reserve of tankers
   f) Priorities on resources to achieve these objectives
2. On the demand and substitution side:
   a) Use of sources of energy other than petroleum
   b) Plans and preparations for shifts of home heating and industrial facilities from petroleum to coal in wartime

The foregoing measures have to do principally with petroleum. Other energy resources are involved principally through substitution for petroleum, because the most extraordinary demands are placed on it in an emergency. Petroleum is also most vulnerable to enemy attack and is the energy resource in which our allies are generally most vulnerable. Furthermore, the civilian economy cannot readily do without most of its normal supply of energy resources, as it can

with steel, even for a short time. The farmer still plows his field, and the worker still goes to work, with petroleum. Nor can the civilian economy, over a long period of time, cut its energy requirements to a fraction of normal demand.

Unlike electric power, basic energy resources are not supervised by any one government agency. There is need for a single agency to coordinate planning, so that development is in step with our security needs and the needs of our expanding peacetime economy. This agency might be the Office of Defense Mobilization. If not ODM, some other suitable agency should be designated to supervise our energy resource problems.

SUMMARY

Energy is derived principally from coal, petroleum, natural gas, and water. Over half of the end-use of energy in the United States is in the form of electric power. There is a close correlation between our expanding production and our consumption of electric power. One of the major problems of preparedness and mobilization is the provision of adequate electric power properly located to fulfill the demands of an emergency. The solution of this problem turns on construction and maintenance of adequate reserves, on a method of operation which makes power systems mutually supporting, and on coordination between power capabilities and programed loads of industrial mobilization.

As in the case of electric power, no clear line can be drawn for coal, petroleum, and natural gas, between programs for peacetime expansion and purely mobilization programs. Readiness depends on development of a pattern for normal operations which will need only limited adjustment to conform to mobilization needs. The lead-times for effecting any major adjustment are considerable and the resources needed for adjustments are the same scarce items and commodities needed in a military effort. We have suggested in the body of the chapter, particularly under the headings of "The power mobilization base" and "Energy in mobilization," certain policies which, if adopted (some are already in operation) and sustained, should contribute materially to a strong mobilization base for energy resources.

TOPICS FOR DISCUSSION

1. Outline the method by which you would determine power requirements (quantitatively and geographically) for a full emergency (consult chapter II).

2. Outline the preparedness program by which you would assure adequate power for a full emergency involving direct attack on the United States. Include your plan for conservation and maximum utilization of power in an emergency.

3. To what extent do you think the national security objective enters into the discussion of public vs. private development and ownership of electrical power?

4. United States diplomacy toward the Middle East and also toward some Latin-American states has at times been called "oil diplomacy." The term was meant to imply a stigma. Should it? Discuss your ideas of a sound "raw materials diplomacy" for the United States in support of the generally accepted objectives of United States foreign policy: the well-being and security of the American people.

5. Discuss allied (including our own) requirements for petroleum in a major emergency and outline your preparedness program for meeting these requirements.

6. You are the civilian defense director of the city nearest your home with more than 400,000 population. Outline your tentative plan for dealing with problems of electric power, petroleum products supply, and natural gas, in case of atomic attack.

SUGGESTIONS FOR ADDITIONAL READING

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[American Mining Congress, Western Division, Denver, Colo., September 22-25, 1952]

AMERICAN MINING CONGRESS, 1952

The American Mining Congress, at its convention in Denver in September 1952, reviewed the report of the President's Materials Policy Commission.

The general sessions were opened with a panel discussion in which two members of the Commission, Mr. Bunker and Mr. Brown, participated.

This section includes the following:

1. A transcript of this panel discussion.
2. The resolutions adopted by the Congress dealing with the President's Materials Policy Commission's report.
3. Material dealing with the discussion from the publication Pay Dirt, published by the Arizona Small Mining Operators.

Attention should be directed to the remarks of Mr. Fletcher and Mr. Bunker and Mr. Brown, which indicate a "belief" and a "conclusion" are not a "recommendation." The Commission has had to fall back on semanitics in lieu of sound policy recommendations which can be supported by majority or minority views.

Discussion of the Paley Report, September 22, 1952

The panel discussion of the Paley report convened in meeting room A of the city auditorium at 11:20 o'clock a. m., Mr. Howard I. Young, president, American Zinc, Lead & Smelting Co., St. Louis, and president of the American Mining Congress, presiding.

President Young. This meeting will be in order. Each of you has been handed a slip as you came into the auditorium. The purpose of those is to give you an opportunity to put on paper any question you might wish to present to this panel to try to answer. I would appreciate very much if you will cooperate with us by indicating when your slip is ready so that the usher can collect them; and also, as far a possible, present these so they can be taken up before we adjourn for luncheon so that the panel will have an opportunity to consider these questions, and they can be answered this afternoon.

If anyone does not have a slip, if you will indicate to the usher, he will give you one or more. We would appreciate very much if you will confine your questions to those phases of the program that are pertinent to the Paley Commission reports which has just been made available to the public in the last 2 or 3 months. We will not recognize questions from the audience except those that are presented in writing. The reason for that is on account of the conservation of time, and we want everybody to have an opportunity to present their questions, and we believe they can do so by meeting with our request. If, however, any of you do not get your questions in until after lunch, we will try to consider them.

I know that all of you, or at least most of you in the mining industry have either reviewed sections of the Paley report or all of the Paley report, or have read comments in the various technical journals or trade publications that come to your attention. This report has contributed much to the thinking within our industry. As a matter of fact, in my estimation, it is the one report that has caused more real discussion and serious thinking in our industry than any of the other Government reports that have been issued heretofore.

As I said a while ago, the theme of our meeting should be forward looking. We must take into account the things that have happened and those that are happening within the free world. We must take into account the changes that have been taking place since we met last in this city, since we met last even in Los Angeles. Within the last months we have seen where a jet driven plane went across the water and back with a period of between 8 and 9 hours. We know that, looking forward, it would not be so many years until transports will probably be driven by jet power where you can get almost any place you want to within the world within 24 hours.

There are a number of us in this industry—and I am one of them—who certainly do not subscribe to the "have-not" theory. I say that we are not a "have-

not" country. We are a "need-more" country. We need more of the products that we produce from our soil than we can possibly produce on our own soil. Therefore, we must consider seriously and constructively the Paley report which is the first documented item or article that we have had a chance to review the thinking of those who are working on our natural resource problems.

I think the industry and the country is very fortunate indeed in having some of our own industry members who have given freely of their time to work with this committee that was created by the President of the United States. Mr. Bunker and Mr. Brown are with us on our panel.

At this time, Mr. Bunker will make the presentation for the members of the Commission. Mr. Arthur Bunker has had many years of mining experience, and he is at present president of the Climax Molybdenum Co. whose principal operations are in the State of Colorado. It gives me pleasure to present Arthur Bunker. [Applause.]

Mr. ARTHUR H. BUNKER (president, Climax Molybdenum Co., New York, and member of the President's Materials Policy Commission). Mr. Chairman, members of the American Mining Congress, and distinguished guests, as most of you know, there was published in June of this year, a report of the President's Materials Policy Commission. As one of the members of the Commission, I have been asked to come here today to join the round table discussion of that report.

Since we are going to discuss certain phases of the report, I think you might be interested in learning something of its history. In January 1951, almost 2 years ago, the President established this Commission and outlined in a general way only the problem which he wished to have the Commission study. His letter of instructions to us reads in part as follows:

"As you and I have discussed, this Commission within the Executive Office of the President is to study the broader and longer range aspects of the Nation's materials problems as distinct from the immediate defense needs. This is one of the crucial problems facing the Nation. By wise planning and determined action, we can meet our essential needs for military security, civilian welfare, and the continued economic growth of the United States. We cannot allow shortages of materials to jeopardize our national security nor to become a bottleneck for our economic expansion.

"The task of the Commission, therefore, will be to make an objective inquiry into all major aspects of the problem of assuring an adequate supply of production materials for long-range needs and to make recommendations which will assist me in formulating the comprehensive policy for such materials.

"I believe the Commission should study, together with any other aspects deemed by it to be necessary, such subjects relating to production materials as the long-range materials, as the prospective and estimated extent of shortages, if any, the consistency and adequacy of existing government policies, and the consistency and adequacy of private industry practices.

"In analyzing these items, consideration should be given also to needs and resources of the nations with which the United States is cooperative on military security for economic matters. In formulating final recommendations, your Commission should take into account all possible methods of bringing supplies and requirements of essential materials into balance.

"Of course, you will want to solicit the cooperation of private industry. Although the Commission will organize its own regular staff and secretariat, you may call upon any other Government agencies for assistance."

The President left us a great deal of latitude and freedom on how we would deal with this extensive subject, and in turn, required that we reach some fundamental decisions concerning the scope of our work and the basic tenets under which any recommendations should be made.

The Commission decided that the nature of the assignment would require that the problem be examined on a very broad front. The evidence of this is a report of five documents containing I believe a million words. I shall not attempt any catalog of the subject matter of the report. It covers far too wide a range for my general remarks.

The question of what time span should properly be encompassed in the study was, of course, a controlling one and had to be determined. The Commission concluded that it should try to select some period which was not so distant that it would be strongly affected or dominated by techonological developments not now foreseeable, but long enough to show the effect of this counutry's dynamic trend in the consumption of materials. With this in mind, the Commission felt that it was reasonable to try to peer into the future about 25 years ahead.

The Commission assumed that for this period, there would be no all-out war, but a continuing tension, and consequently, continued maintenance of an active rearmament problem.

Obviously, we have no idea, nor do we suggest we have any, of what conditions will prevail in this period, but I am sure you will agree that it's necessary to make some kind of assumptions on which to base any estimates. We then addressed ourselves to describing our basic beliefs and tenets.

(Mr. Bunker then read his prepared paper.) [Applause.]

President YOUNG. Thank you very much, Mr. Bunker. Mr. Bunker has presented the background that the Commission used in connection with the Paley report. Mr. Brown will participate in the discussion of the various statements that are made by members of our panel and in the answering of the questions that are presented.

Very fortunately, we all recognize that the mining industry is made up of a group of rugged individuals, individuals who do not shrink from expressing their own idea on any of the problems or policies that might be presented by any group or by the Government, and we have a number of those rugged individuals on this program here today, and I want to present first Mr. Andrew Fletcher who has for some 23 years been connected with the St. Joseph Lead Co., starting in first as vice president and treasurer and director of the company in 1929. He is today president of the St. Joseph Lead Co. whose operations are not only in the United States, but also in South America and in other foreign interests. Mr. Fletcher. [Applause.]

(Mr. Andrew Fletcher, president, St. Joseph Lead Co., New York, then presented his prepared paper (marked No. 1) with the following interpolations:)

Interpolation No. 1: And I think in fairness to the committee and all of you, I want you to know that what I am going to tell you this morning, I told the Paley committee both by letter and by interview before they came out with this lead estimate, and then I want you to think as I am talking why should there be such a difference of opinion between the Paley Commission's estimate and that of industry.

Interpolation No. 2: I might add that I told them before they came out with the estimate that I thought they were way out when they estimated 1,800,000 tons.

Interpolation No. 3: Supposing the Commission had come out with a guess of around 200,000 tons, and shown the necessity for importing less than we have been importing for the last 12 years. I think it must be apparent to you, as it is to me, that their recommendations for international controls, buffer stocks, price stabilization, and everything else just look silly.

(Mr. Fletcher then concluded his paper.) [Applause.]

President YOUNG. Thank you, Mr. Fletcher. I might say this, gentlemen, so you will know what our plan is. We will adjourn this meeting promptly at 12:30 and then come in again at 2 o'clock, so if you have a luncheon engagement, you will have ample opportunity to meet it.

I am going to ask either Mr. Bunker or Mr. Brown to reply to these papers.

Mr. BUNKER. Mr. Chairman and Mr. Fletcher, I have not had the opportunity of looking at Mr. Fletcher's statistics, and I have only heard them just now. Naturally, I am sorry that he doesn't agree and thinks the Commission is reasonably off base, but I don't happen to believe that what he has to say, that all the figures he has adduced have a distinct bearing on the case.

We have said from beginning to end, and we must say and everybody must know that nobody can be a pinpoint crystal gazer. I don't think that some people are inclined to even like the idea of making forward estimates. On the other hand, I think it's quite human to do it from the day one is born, and to do it in every business and every family, possibly not for 25 years, but for some period of time.

Now, certainly, estimating population growth seems to me a more legitimate thing than maybe any other form of estimation. We have watched our medications develop rapidly which have increased our life expectancy, and we have taken the most modest population growth of any serious group who were studying and working on that problem.

Take, for example, our estimate of automobile population. We have been very conservative and said that the increase in automobiles per capita will remain the same, and that the number of cars on the road will simply be represented by the increase in population. But now let's come back to the knitting which is the subject of lead.

Mr. Fletcher says that we took 1950 and should not have done so; the real consumption in 1950 was 1,200,000 tons. I think one of the important things to

talk about is the enormous change that's happened in the lead industry in the United States in 25 years. Of this 1,200,000 tons of lead, the United States with very favorable prices could produce only one-third of it. When 25 years ago they could produce 100 percent of our needs, produced one-third of our needs in 1950, and that's all they can produce today. And I think that's a very serious problem in terms of national security. Suppose there is no increase—they can produce only a third in 1975. It remains a very serious problem.

Let me say another thing. We have no difference apparently between us in one thing which is the estimate of scrap lead. We have said 750,000 tons and recognize the enormous part the increased scrap returns will produce. Mr. Fletcher says 800,000 tons. There is a 6-percent difference in 25 years. There is no such thing as a more accurate form of estimate. We are in agreement.

Let's say another thing. Whether we use 1,200,000,000 tons, which we used, or 1,950,000,000 tons, which the Commission suggested we use 25 years hence, in terms of our ore reserves, taking all reports which we had from industry, we see quite an extraordinary situation, the import of which, of course, is in the very nature of the mineral itself. The industry reported to us that the known reserves in the United States, as they wished to report, were 1,750,000,000. We have repeatedly said in the Commission's report, of course, we think there will be that 7 million tons, another 7 million tons, and another 7 million tons. We have said there will be a lot of problems in finding it and locating it and using different methods, but I am sure you will all agree with me that, if you can use a million and a half tons of ore a year and then admit you have a million and a half to a million seven hundred and fifty thousands tons of known reserves, it's not a very unhappy condition, and if you couple with that the fact that the ore you can produce with the one-third of 430,000 tons, and imagine it in time of war, it's not an unhappy condition.

What are the new uses? The new uses are going into gasoline and octane which are completely not productive of scrap or recoverable materials. If we get into war, what are the war uses?

I happen to think the issue is that you have an important problem when you can produce only one-third of your country's needs, and not whether some statistics are going to prove to be just exactly right.

President YOUNG. Thank you, Mr. Bunker.

Mr. FLETCHER. I am very happy to have Mr. Bunker admit that his estimates are probably just as apt to be wrong as our estimates are. That's fine. But what I would like to have is somebody to explain to me why it is that there was such a difference of opinion, and is the difference of opinion the justification for beginning international agreements, buffer stocks, price controls, and all that? That's the only thing that worries me.

I mean, Mr. Bunker can guess just as well as we can guess, but I want to know why they guess such a black picture when we have told the National Security Resources Board, we have told our customers, we have told everybody that we are not worried about the future supply of lead, and I told that to the committee before they came out with the report, and that is what I would like to know, and I am not interested in arguing as to whether we are right or whether the committee is right. I want to know why they paint such a black picture after we who theoretically know what we are talking about gave them a pretty optimistic picture?

Mr. BUNKER. I would like to say one more word. There are two problems: One, I don't think there is any use in arguing about statistics. I am sure Mr. Fletcher knows more about lead. I am not a bit sure that he knows more than the Commission about statistical preparation. However, he feels that we have nothing to worry about in the lead problem. If we use all of Mr. Fletcher's figures, to make it easy, the Commission would feel we have a lot to worry about in the lead problem.

We think when you come out and say you can produce a third of what you need, it is really the cause of worry, and I don't think the problem changes its aspects at all whether it's 28 percent or 44 percent. I still think it's a very worrisome problem and has to be dealt with.

Let me say this. There has been an undercurrent, and I am sure Mr. Fletcher won't object if I name it, an insinuation that the Commission—I don't care what echelon, but I am sure in all probability not at the top—has devised figures so that we say, "All right, we must increase the possibility of production; then consequently, we must increase our estimates and the possibility of consumption so that we throw a bad picture on the screen."

Now, nobody is sure what hundreds of people do, but let me tell you that I happen to think that the Commission dealt with this question with whatever intelligence it might have had and with integrity of the highest order.

Obviously, we have a very peculiar situation in lead statistically, but I have not heard nor has the Commission heard of any other single commodity's quarrel on the basis of rough estimations of the future, and that goes for all the other commodity reports we have submitted. This happens to be an isolated case, but I would like to say that it is not appropriate to suggest and insinuate the Committee tried to make a bad case. I happen to think using Mr. Fletcher's statistics, the case is very bad indeed.

I thank you.

President YOUNG. Does any other member of the panel wish to remark on this particular question? Ira, do you?

Mr. JORALEMON. I think not.

President YOUNG. I would like for those who prepared questions to please hold them up so they can be collected before we go out for lunch.

The next speaker on our panel is Mr. Simon D. Strauss. Mr. Strauss started his business career with the Engineering and Mining Journal Press. He spent a number of years in the Metals Reserve Board during World War II. He's been connected with the American Smelting & Refining Co. as vice president and director of sales since his joining that organization in 1945. Those of us in the industry have the highest respect for Mr. Simon Strauss' analysis and statements regarding the metal industry. Mr. Strauss. [Applause.]

Mr. SIMON D. STRAUSS. Mr. Chairman and ladies and gentlemen, I shall confine my initial discussion to the Commission's recommendation that international buffer stocks should be created by our own and other governments for the purpose of stabilizing raw material markets. This is a proposal of such magnitude that it alone could properly be made the subject of our entire proceedings. I shall therefore be able in the alloted time to discuss only a few aspects of it.

The Commission believes that wide swings in raw materials prices discourage investment in new ventures and that consequently capacity tends to be inadequate to meet the peak levels of demand at times of international stress. In addition, it argues that stabilizing raw materials prices would assist the economy of the so-called underdeveloped countries, thereby reducing the hazard of political disturbances and perhaps preventing expropriation of foreign investments such as has occurred in the Near East and in Latin America.

This is tempting bait to our industry. Miners are apt to grow impatient with those of us in the commercial end of the business when they see prices of metals decline. I must admit that complaints on their part about rising metal prices are rather rare. The prospect of being able to plan development and production from a mineral deposit with assurance that prices will not vary materially is bound to appeal to the miner.

But, before we leap to the bait, let's examine what is really entailed. Two questions immediately occur: One, Is the plan really feasible? Can it be made to work as the Commission suggests? Two, further, regardless of the answer to question 1, Is the plan compatible with the spirit of free enterprise?

Let us deal first with the feasibility of the scheme. The Commission's report suggests that these buffer stocks would be operated by an international group in which both producing and consuming countries would participate and to which both would contribute financial support. Each country's contribution might be determined, the Commission says, by its relative share in world exports and imports.

There is a problem of currency here. Would each country's contribution be in its own currency? When the buffer stock buys, would it pay for its purchases in the currency of the country from which it buys? When it sells, will it sell in the currency of the country to which it sells? If so, the weak currency will soon drive out the strong. The buffer stock may find itself with most of its working capital, after a time, in, let us say, lira, and yet most of its purchases to be made in, let us say, dollars.

The Commission states that the aggregate cost would not be so great as to overtax the resources of participating countries, but gives no estimate of the actual amount required. My own guess is that the amount would have to be at least as great as that involved in the United States stockpile effort, a program now estimated at over $9 billion. Further, I would say that the resources of the participating countries are already overtaxed without any buffer schemes—in the sense that most governments are operating at staggering deficits

and are levying record-breaking taxes. Another nine billions cannot be shrugged to one side as of no moment, but probably should not be the major consideration.

A far more serious objection is the improbability that the fifty-odd nations which will be involved in the management of the buffer stocks can be brought together to operate in an effective or prompt manner. Let us look at the record of a few recent attempts at international economic cooperation.

An international tin committee on which all the leading tin-producing and consuming countries are represented has been in existence since the end of World War II. The committee has met at least once each year in such widely scattered places as Washington, Brussels, London, Paris, Rome, and Geneva. Statistics have been hashed over, proposals have been put forward for expanding production or limiting it, for increasing consumption or limiting it, for price stabilization or for price decontrol, and for international agreements, to assure the stablity of the tin market for years to come—protecting the interests of consumers and producers alike. The participants in these conferences have included the usual range of real experts, of sincere and well-meaning government people, of responsible representatives of industry, and of bumbling bureaucrats who have gone along for the ride and the free martinis.

What have been the actual accomplishments? None. After 6 years of interchanging ideas, the producers and consumers of tin were so angry with each other that during 1951 the metal-trades press published almost daily official statements of vituperation in which the language was so intemperate I hesitate to reproduce it here.

The second experiment was the International Monetary Fund which was formed at the end of World War II for the purpose of facilitating unimpeded multilateral trade and the general convertibility of currencies. Fifty-four nations are now members of the fund. Please note that currencies are produced by governments. This is a field in which private enterprise is prohibited, and if undertaken is subject to fines or imprisonment or both, and a field in which government has undisputed power. Here surely international cooperation should be successful.

The currency equivalent of an international commodity buffer stock was set up for the monetary fund. The total of all individual quotas amounted to more than $8 trillion. Yet, in the first 7 years of operation only 10 percent of this total has been actually used. Despite the existence of the fund, its management reports that during the last 7 years the balance of payment difficulties have been continuous or recurrent, and most countries have either been unable to make substantial progress toward freer international trade, or have had to reverse from time to time some of the steps taken in that direction. This is the fund's own description of what has occurred.

If an international group consisting solely of government representatives is unable to stabilize the value of currencies, which governments alone can issue, is it likely that they can successfully stabilize the value of commodities produced by private enterprise?

I do not wish to belittle the abilities or motives of the many devoted, honest, and sincere government officials who have conscientiously struggled with the problems of minerals supply in the period since the end of World War II. The great majority have acted in good faith and with the motive only to accomplish the tasks to which they have been assigned. Many of them are with us today, and their efforts I think should be applauded by all of us.

However, Government operation by its very nature is slow and cumbersome. Within our own Government, negotiations for Bolivian tin, Chilean copper, and many other minerals have been delayed time and time again not by deliberate procrastination, but by the necessity of reconciling the divergent views of the Munitions Board, the RFC, the General Services Administration, the Office of Price Stabilization, the Defense Production Administration, the State Department and the Department of the Interior. When a decision is finally reached the situation frequently has meanwhile been altered radically and a policy that may originally have been sound is no longer applicable.

If our own Government is so slow in coming to a decision, what then about an international group? The answer may be found in the futile record of the International Materials Conference, the accomplishments of which have been substantially nil. The need for referring decisions back to the home governments, the ability of a producer interest or a consumer interest to block action on a matter of direct concern, the tedious task of creating an agreed statistical

base prior to any action at all, all of these have made the so-called allocations of International Materials Conference simply a paper record of no significance.

The Commission describes the buffer stock as being based, and I quote, "on reasonable anticipation of the long-run price of the material under control. Ceiling and floor prices would be based on the best estimates of future production and consumption, periodically modified in the light of actual market behavior and revised forecasts."

Today we have Mr. Bunker's and Mr. Fletcher's forecasts, two able gentlemen with two honest differences of opinion. I submit, gentlemen, that any international buffer stock would run into those differences constantly. It would not be a matter of disagreeing today about 1975, but disagreeing about 1953.

Now, this prospectus makes it sound as if nothing but reason and light would govern the decisions of the buffer stock authorities. We know, of course, that that would not be true. Political considerations would be certain to influence the decisions. If the authorities concluded, for instance, that world aluminum production should be fostered at the expense of copper, then that is what would happen. The Defense Production Administration last year was for a time following a course that seemed intended to foster the one industry at the expense of the other. On an international scale similar favoritism would have results incalculably more damaging because with their power to set minimum and maximum prices and to withhold or market stocks running into the hundreds of thousands of tons the central authorities would have undisputed control of the market.

Furthermore, how good is governmental judgment likely to be as to the long-run prices of the materials under control? At best, it will be no better than that of private industry, which is subject to wide error, and more likely, it will not be as good. Let me cite an instance.

I yield to none in my admiration for the British civil service, which has a long tradition of integrity and devotion to the public good. Yet, look at the record of the British Government in the last 2 years in its bulk buying of materials.

Convinced that shortages of lead and zinc would prove long lived, the British last year bought large quantities of both metals for delivery extending into this year at prices of 21½ and 23½ cents a pound, respectively. Had it not been for this British buying during 1951, the prices of lead and zinc outside the United States would not have gone as high as they did and the shortages would not have been as pronounced.

But, by the end of the first quarter of 1952, the physical stocks of lead in the United Kingdom were so great that the British Government resold a huge tonnage of lead to the United States stockpile at losses ranging upward from $50 a ton. As for zinc, with the present market price of 13½ cents a pound—incidentally, that's a flash announcement—the British are still taking delivery of large tonnages at prices in excess of 20 cents a pound and their stocks are climbing by several thousand tons a month.

The British position in zinc is now such that they have told all sellers of zinc to Empire producers that they will buy no zinc whatsoever during the first half of 1953.

Now, I have not singled out the British Government because I believe it to be more prone to error than others; on the contrary, any group undertaking the same job might well have made the same mistakes.

My point simply is that when a government or a group of governments errs, the effect on the market is infinitely more serious than when a private buyer or seller does so. The British buying in 1951 and selling in 1952, far from helping to stabilize metal markets, actually has tended to increase instability.

The private consumer might well have made the same mistakes. I can testify from direct experience and personal experience that frequently the private seller misjudges the market trend, but a private consumer or a private producer can push his error only so far, and then the inexorable factor of financial prudence makes him correct his position.

No British private consumer, for instance, could have bought 50,000 or 75,000 tons too much lead in 1951. He would not have had means to do it. But a governmental buying agency—and this is doubly true of an intergovernmental agency—has almost unlimited resources at its disposal. It simply taps the public till for additional funds to perpetuate its mistakes.

Private investors are all too aware of the unpredictable turns which governmental decisions may take. Regardless of the assurances that may be contained in any agreement establishing an international buffer stock—and I say this to Mr. Bunker because I know he feels a blueprint could be drawn up that would

protect the industry, but I say to him—that regardless of any assurances that investors would be bound to look with a jaundiced eye at the existence of huge inventories of metals in the hands of a group of government officials subject to political pressures: Elections in Chile, revolutions in Bolivia, confiscation in Iran. One cannot forecast what the nature of that political pressure would be.

Nevertheless, the temptation to use these enormous buffer stocks to accomplish diplomatic, military, or political ends would be enormous and could not be resisted.

I conclude, therefore, that a governmentally operated international buffer stock, if undertaken, would hang over the metal markets like a sword of Damocles. Decisions would be long delayed in the making, and while uncertainty over them existed, neither producers nor consumers could plan or operate in a normal way, dreading the possible disastrous financial consequences of misjudging the buffer's stock's programs. We would wait in fear and trembling for the results of this monstrous mountain's labors, and when it did come forth, I suspect it might well be a mouse.

The buffer stock proposal is advanced by the Commission on the theory that it is difficult for private capital to operate in a market in which prices fluctuate widely; it would be intolerable, however, for private capital to work in a climate in which the entire investment is in constant jeopardy because of potential political decisions of an organization responsible to no single nation or to no single group of stockholders.

All efforts in the past at international controls over raw materials have been a failure when these efforts have been made by private cartels. The substitution of politicians for industrialists does not make the cartel theory any more palatable. [Applause.]

President YOUNG. Thank you very much. There have only been seven people who have put in questions on this very important subject. I know there are many more in here, and I will appreciate your cooperating by making this meeting just as constructive as we can.

Mr. Bunker or Mr. Brown, do you wish to reply?

Mr. BUNKER. Yes, Mr. Chairman, I would like to make a short reply. The only statement that Mr. Strauss made with which I violently and completely disagree is the one in which he became a mind reader. He said that Mr. Bunker believes exactly the things that Mr. Bunker doesn't believe in. I don't feel for a moment any confidence in the Government blueprint. I never have and have spent a great many years with the Government, and I don't know why Mr. Strauss assumed that the could read the innermost sanctuaries of my mind, but I really don't believe he could at all.

Now, just let me go on say that I do not at all read in our report what Mr. Strauss reads. We have in our volume I a review of the difficulties of doing business and of obtaining materials under the best conditions from foreign shores. I don't think there is much argument as to whether we need materials from foreign shores in increasing abundance at good, low prices, and the question is how to get them. In subsequent volumes we expand the difficulties about tenfold and say there really isn't anything more difficult, and then we say we think industry and everybody who is engaged in this thing should really regard this as one of the tough ones and explore it and see what they can do about it, hopefully, that there may be some way you could improve the rules of the game.

We all agree that not the price system or price control is a bad thing. We say it's a good thing. We say the sharpness and the violence of it sometimes certainly do delay, postpone, and interrupt the creation of capital formation and productive facilities, and so, we finally say, cast between these two dilemmas, we think these things are worth exploring on a test case only—worth exploring. We don't say to go and do them. We say they are filled with hazards, but what have you got as an alternative? Either the present conditions which we don't think may move fast enough to give you what you need or you can fall back into the cartel arrangements of production restrictions which even Mr. Strauss agrees are very, very unsatisfactory.

So, we finally come out and say in our language, "We think you must explore these things, see if you think they will work as an alternative to licking a tough problem."

So, outside of Mr. Strauss' mind-reading propensities, I find myself in extraordinary agreement with him.

Mr. STRAUSS. I would very much like to reply, and I apologize to Mr. Bunker for having said "Mr. Bunker" when I should have said "the Commission." That was unintentional.

Let me read you the Commission's conclusions on this, the Commission's conclusions that I was speaking of: "The Commission believes that on balance the international arrangements that hold the greatest promise for stabilizing material markets (hold the greatest) and at the same time, for promoting the increased production of materials that the future will demand are the multilateral-contract type of agreements and buffer stock agreements either without or with quota provisions on exports or production." The report says "the Commission believes." I don't believe it and that's what I was trying to say.

I would like also to say this: that I do not believe even the exploration is worth the effort, and the reason I say that is that we have had a record in this country for the last 20 years of exploring things and the explorations have proved permanent [applause], a little bit like going into some of the limestone caves in Tennessee or the Pyrenees. I think we might go in on an exploration venture and come out feet first.

My candid judgment is—and I agree with Mr. Bunker in this—that the present system tends to delay and harass the individual producer; it makes investment a risk, but it's always been a risk in our industry, and for my money it will continue to be a risk in preference to becoming the subject of governmental decision. Centralization of power, centralization of decisions is getting to be the greatest evil of the day. We are putting too much power into too few hands. I say in the metal markets, let's keep the power in as many hands as possible. [Applause.]

President YOUNG. I know you will pardon the Chair for making an observation. I agree with this free market business, but let me say one thing. If those that are responsible for markets are going to cut the throat of the domestic producer, as has been done in some commodities in the nondistant future, they are inviting exactly what they are opposing at this time. [Applause.]

Have you anything further to say?

Mr. FLETCHER. No; I have said enough.

President YOUNG. I think I will adjourn this meeting until 2 o'clock, and we will meet here promptly at 2 o'clock. If you have questions that you have prepared, please hand them to Mr. Conover or Mr. Dickinson.

(Whereupon, the session was adjourned at 12:45 p. m.)

AFTERNOON SESSION

The panel discussion of the Paley Commission report was resumed, with President Young presiding.

President YOUNG. The next presentation will be made by Ira Joralemon, whom I think is well known to practically everyone in this room. Mr. Joralemon is one of the outstanding mining engineers and geologists of this country, and has free world reputation. Mr. Joralemon. [Applause.]

Mr. IRA B. JORALEMON (consulting engineer, San Francisco, Calif.). Mr. Chairman, and ladies and gentlemen: The report of the Paley Commission is one of the finest source materials for the study of the mineral industry that we have ever had. However, many of us differ with some of the projections and some of the conclusions.

I am going to cover just one small aspect of the conclusions now in a few minutes, and I don't want it to be taken as a general criticism of the report.

(Mr. Joralemon then presented his prepared paper entitled "A Have-Not World" (paper marked No. 2)). [Applause.]

President YOUNG. Thank you, Mr. Joralemon. Mr. Bunker or Mr. Brown, do you have any comments?

Mr. BUNKER. Mr. Chairman, I would like to talk a little bit about the same subject matter. I don't pretend that I understood everything that Mr. Joralemon was saying. However, I did make some notes. For example, to start in with the report, I think the report is replete from end to end by saying that the enlightened self-interest of the United States is linked up completely with the well-being of all of our friendly nations outside of the Iron Curtain. It doesn't say it once. It says it a hundred times and on every single issue of every material supplied.

It also says that in the consumption of materials, the other nations, other than the United States, can well be expected to increase their percentage consumption of materials at a far greater rate than the United States, and makes statistical provision for their consumption.

It is almost impossible to sit here and comment upon a series of statistics which I have never seen and which I only get a vague mental picture of. It's our belief two or threefold. In the first place, we go through the report and say again and again and again that we are not a "have-not Nation." We say even at the end of the 1975 period, compared to almost any other nation in the world, we will be replete with enormous amounts of raw materials, and if forced to sustain ourselves, can sustain ourselves on a very, very high level standard of living. We do, of course, say that we will be using, as far as we know, the lower grade of materials, falling back on technology, and will be reaching things like the present enrichment. That's been the tendency in the past 50 years.

If, on the other hand, as Mr. Joralemon says, the world is a "have-not" world, well, I can go along with that, if you want to take a long-enough projection, but where does it leave you? I'll tell you where it leaves you.

The Lord laid down these enrichments of materials with a miscellaneous hand here and there, not because of any international boundaries, but let's assume, not in 25 years, but in 50 years or 100 years the world is a "have-not" world, or that we are moving there rapidly, so you are going to say, "No, we must look toward the interruption of the increasing standard of living of America." Then the problem is even far more serious than the Commission has said, and we ought to take much more vigorous steps.

There was a small point which Mr. Joralemon touched upon, which is, do we flatten out our curves, or have we regenerated periods in our economy? I completely agree that the history of 300 years, judging if you wish, first from the British Empire which had the longest statistical record, is that you have definite regenerative periods. Unhappily, most of them come after the inventive periods of war. They last on the average of 25 or 30 years, and then unhappily mankind resumes conflict, and the regenerative period fans up again. You do have the flattening periods, but over the broad thing, you have a trend line, which when smoothed out over generations, shows a normal, even gain in increased consumption.

I hope the question of the "have-not" world is very, very far removed, and that it will be a century or two before the American Mining Congress will have to deal with it.

President YOUNG. Ira, have you any comment to make?

Mr. JORALEMON. I think the Commission's report itself makes it clear that the world could not supply—the world resources could not supply—the rest of the world on anything approaching our standard of consumption. Since that is so, I still think that we are expecting a great deal to continue to increase our consumption by more than the increase in any other part of the world.

Mr. STRAUSS. I think in the first place that if we could, we ought to use the expression that Mr. Young suggested of a "need-more" nation instead of a "have-not." Why don't we all agree on that? I think that's a good way of putting it.

In the second place, since I was rather critical of some of the things the Commission had to say this morning, I would like sides on their side in this particular issue. I think that Mr. Joralemon is confusing the world as he would like to have it with the world as it is likely to be, and it is my impression that the job the Commission had to do was to describe the world as it is likely to be in 1975.

Now, he mentions specifically the statistics on copper. I think he said the underdeveloped countries are using a third of a pound of copper per capita now and might be using a quarter of a pound per capita more than that by 1975.

I recall distinctly during the period of the depression when all the sellers of metals were sitting around wishing a customer would stray in, that we used to cheer ourselves with the comforting thought that if only the Chinese and the Indians would use one pound per capita, per person, the surpluses would vanish. That unhappy day is 20 years ago.

Twenty years ago I read and have read since that India is going to be economically developed. I have read that China is being economically developed into an industrial nation. Yet, after 20 years, the fact remains that they are still not using a great deal of copper. I don't believe that we are taking the copper away from them, that we are depriving them of it. I don't believe that if we refused to use their copper that it would automatically mean they would use it.

What is likely to happen is what we are discussing, and my guess on that particular point is that the Commission is right; that the rate of consumption of copper in the underdeveloped countries will increase very slowly on a per capita basis as compared with the probable increase here.

President YOUNG. Any other member of the panel wish to comment? Donald McLaughlin, do you wish to comment on this?

Mr. DONALD H. MCLAUGHLIN. I believe the dispute is whether one takes a human or geological point of view toward the centuries in hand. No doubt, we are going to be a have-not world geologically because we are eating up ore deposits geologically at a fast rate of speed, but I don't think that is going to speak for the human point of view.

President YOUNG. When we stop and think that we have only geologically mapped 11 percent of our country, we still have a lot of it to find out what is under it.

We are very happy and very fortunate indeed in having with us a member of the United States Senate who is vitally interested in the minerals and natural resource problem. Our guest and member of the panel served on the Second District of Idaho in the 76th, 77th, 78th, and 79th Congress, was elected to the Senate in 1946 and in 1950.

It gives me great pleasure at this time to present the Honorable Henry C. Dworshak of Idaho. (Applause.)

Honorable HENRY C. DWORSHAK (United States Senator from Idaho). Thank you, Mr. Chairman. Ladies and gentlemen: First, I want to assure you that I am somewhat hesitant in approaching what might be termed by many of those present as a discordant note in this discusison. I want to commend the members of the Paley Commission. I think they have rendered worthwhile service. I don't know what finally will be done with this report, but I do think that it has been stimulating to all those interested not only in mining, but in the natural resources of our country.

I am under somewhat of a disadvantage, and yet, I do have one distinction. I do not appear here today as an authority or expert in the mining industry. I shall not endeavor to discuss during my brief time the aspects of whether or not this report has been accurate in its forecasts as to the status of mineral production in the United States and throughout the world 25 years hence.

I think that it is my responsibility to inject what might be called the political aspects of this panel discussion. Of course, I realize, as you do, that finally the report will be submitted to the Senate and to the House of Representatives for hearings and for discussions.

There is a question, of course, that in the coming months the administrative agencies in the Federal Government and the executive department may arrogantly assume the responsibility for implementing some of the recommendations made by the Commission. That has been done in the past, and it may be done again in the future.

There has been much disagreement among these distinguished members of the panel whom we recognize as experts, and I think that is something that we should all rather heartily accept because you know this Commission report involves a million words. I have heard of voluminous congressional reports and hearings on Capitol Hill, and I am wondering whether the Paley Commission has not done an excellent job in trying to outdo Congress in this respect.

What reception will Congress give this report? We don't know, of course, but I think it will be a challenge, a stimulating challenge to the legislative branch of Government, and whatever emanates from the hearings to be held in the next session of Congress will have a beneficial effect upon policies and planning which may have far-reaching effect not only in national preparedness, but in utilizing advantageously and to the maximum extent those natural resources with which our country is blessed.

I tried to analyze some of the recommendations. I will confess I haven't had time to read carefully the report, and I doubt whether many in the audience or even some of the members of the panel, have had that opportunity, but I want at this time to point out, as I say, what I consider a few of the political aspects because they are the recommendations of the Commission which undoubtedly will attract the attention of congressional hearings.

Chapter XIV of the report deals with removing barriers to trade, and the Commission in the interest of expanding world trade seeks to justify repealing our tariff laws and the Buy American Act, and then without any supporting evidence, contends that a device such as the International Materials Conference will remove barriers to trade.

When duty on imports is eliminated, what protection is accorded domestic industry with its high operating costs? That seems to be a perpetual problem on Capitol Hill. You can initiate a spirited controversy or debate whenever you mention tariffs or free trade. Of course, we do not have ample time to enter into that discussion at this time, but that is inherent in the recommendations of the Paley Commission.

The International Materials Conference was never authorized specifically by the Congress. Of course, some may contend that the President has the constitutional authority through the State Department or some other agency within the executive branch of Government to create and give authority for setting up an operation like that involved in the International Materials Conference.

During the recent session there was some discussion in the Senate, particularly, because it was contended that at no time did the Congress have an opportunity to determine whether our country should participate in an international agency delegated with the authority to make allocations of all strategic and scarce materials, not only to our country but to all of the allies or the free nations of the world.

I think that the State Department deliberately circumvented congressional mandate, and I question whether the Government is authorized to permit this U. N. agency to thwart free trade.

I recall being on a panel discussion in Washington about 3 months ago when one of the supporters of the International Materials Conference, a member of the Senate, contended that the United States was getting more than its share of the free world copper. Well, I was not so much concerned about that, but I didn't believe the assertion made by Senator when he said that we had received 80 percent of the free world copper, and so I addressed an inquiry to the Office of the International Materials Conference, and I was told that in the second quarter of this year, the United States, all of its industries, had been allocated 49.1 percent of the free world copper. So you can see that on Capital Hill we engage in these controversies just as do the members of the panel, because there is, after all, some difference between 80 percent and 49 percent when it comes to an allocation of free world copper.

The United States furnishes the funds for other countries to buy scarce minerals at low world prices with the United States buyers operating under the restrictions of the OPS. Many of you will recall that following the outbreak of the Korean war, we had a stimulation of world production of minerals, essential minerals. Ordinarily following a normal pattern, we were able to buy copper and lead and zinc and a lot of other necessary minerals, but when we approached an era when we had higher price levels and world markets than we had in the United States, those good friends of ours who ordinarily sold us many of their minerals immediately digressed and ignored the United States and our requirements because they preferred to sell their product in the world markets where they could get much higher prices than those which were available under the OPS ceiling prices in this country.

In addition to recommending elimination of tariff barriers, the Reciprocal Trade Agreement should be carried forward and its authority expanded, the Commission believes.

We don't have time to get into that thoroughly. I happen to be one of only two United States Senators who voted against this on the occasion of extending the Reciprocal Trade program within the past year. Only two of us voted against that. Of course, that wood indicate that the overwhelming sentiment in the Senate was in favor of extending and continuing this Reciprocal Trade Agreement program. But, so far as I am concerned, it has always seemed to me that it has been a 1-way program, a 1-way street, because very infrequently has the United States been able to get any material or reciprocal benefits through the operations of the Reciprocal Trade program.

The Commission recommends legislation to authorize unilateral elimination of import duty on any industrial material in either crude or refined form whenever such action is in accord with the national interests.

Such tremendous power in administrative agencies would jeopardize free enterprise by subjecting a specific industry to the whims of Federal officials. It's all right to have that overall objectives, but, on the other hand, it's extremely difficult to attain that goal when the administrative agencies have such unlimited power.

In the spring of 1950, prior to the Korean outbreak, when American mines were closing down because of depressed prices of lead and zinc, at the request of the Emergency Lead Committee, I appeared with others before the Joint Reciprocity Committee, appealing for restoration of the tariff on lead on December 31, 1950. We succeeded in getting suspension of that particular part of the Mexican trade agreement which had reduced the duty on lead from 2½ cents per pound to 1⅛. Lead prices were depressed to such an extent that mines all over the United States were closing down because they could not operate under the prevailing low prices and the high operating costs. Of course, that gain was

revised subsequently to when under the Torquay agreement with Canada, the duty was cut again to 1⅛ cents per pound, and under the "most favored nations" clause of the Reciprocal Trade Agreements, Mexico immediately resumed that trade advantage.

We have heard a lot of discussion about the stockpiling program. I presume we could devote an entire session to the discussion of that with this panel or any other panel composed of you leaders in the mining industry. That's a moot question, a very controversial issue in Washington, because, while we all understand the mandate of the Congress in setting up stockpiles of essential materials upon which we may rely in case of global war when foreign production is no longer available or are materially cut down, it is difficult to get agreement among those agencies in Washington representing the Army and the Navy and the Air Force and other civilian agencies of the Government. That stockpiling program is extremely difficult.

I recall that in 1950 when prices of lead and zinc were depressed, we appealed to the Munitions Board to stockpile these minerals. There was no interest at that time, but when prices increased materially, the Government purchased these commodities. They were willing to pay 5 or 6 or 7 cents per pound more for lead and zinc for the national stockpile, but at a time when the industry was depressed and those minerals were available at low prices, there was little interest on the part of the Federal authorities charged with the administration of the stockpiling program. The record is clear in that respect.

Now, may I just take a minute or two to talk about a specific instance wherein the stockpiling program was a moot question?

At Stibnite, Idaho—and I hope you will pardon me for referring to my own State—we produced about 90 percent of the peacetime output of antimony at the Bradley mines. Recently, because of the curtailed prices and the high operating costs, it was impossible for the mining and smelting operation at Stibnite to continue in competition with world production. We appealed to the stockpiling authorities, and they were not interested.

I don't like to inject this into this discussion, but I think I might refer to 1 or 2 sentences from letters on this subject because I think it will more graphically stress the point I am trying to make at this time as between the desirability of maintaining production of scarce materials like antimony in this country and relying to a great extent upon foreign production.

I have here a letter dated August 7, 1952, written by an official of the Munitions Board, and I quote one paragraph as follows: "Historically, this country has been dependent upon imports for approximately 75 percent of the antimony supply. Domestic antimony mines have furnished less than 20 percent with the balance being derived from domestic and lead ores. There are rumors of a probable curtailment of production in Bolivia and the Union of South Africa. In this connection, the Foreign Section of the Defense Minerals Production Agency is conducting a thorough investigation of the future supply from these sources."

And I ask you what sources? Not domestic, but foreign sources. So, in this specific instance, the Munitions Board is interested not in maintaining an adequate production of antimony in the United States to be available in case of global war, but rather they are more interested in determining the adequacy of foreign sources of antimony.

I have another letter written by an official of the Defense Materials Procurement Agency in reply to a letter dealing with this same subject, and I should like to quote from this letter this paragraph: "This information indicates that antimony prices will be depressed until demand improves and industry stocks are reduced. It is also evident that productive capacity available to supply United States needs is sufficient for the traditional consumption of primary antimony on the order of 15,000 tons per year. While there may be a lag in resumption of production when consumers reenter the markets, we do believe the Government assistance to producers is justified under present circumstances. Should further information be obtained which would indicate that Government assistance is justified in expanding the supply of antimony, such measures can then be taken as are necessary to increase production."

Again, I point out that this letter reflects the thinking in the executive branch of the Government at Washington which is that we are not necessarily concerned about maintaining or expanding domestic production of antimony and other scarce materials, but rather, we should concern ourselves about the adequacy of production in Bolivia, in the Union of South Africa, everywhere else in the world except here at home in the United States.

I mention that because I think it is one of the problems which must be solved by your industry.

Many conclusions reached by the Commission are illogical and highly discriminatory because they would give preferential treatment to the development of mineral resources abroad. Chairman Paley in an interview printed in United States News recently said this: "We encourage the Government to take actions aimed at creating situations favorable to private foreign resources development."

I refer you again to those letters and to many other instances wherein the agencies of government in Washington are more concerned about making loans and manipulating production abroad instead of doing everything possible to encourage expanded production here at home.

This statement of Chairman Paley is an astounding one and reflects the basic philosophy and thinking of the economist. Why should our Government stimulate expanded production of scarce materials abroad while discouraging use of reliable sources at home? In case of global war, foreign shipments might be blockaded, and then we would be entirely dependent upon domestic production. If the latter has been neglected and essential minerals were not available, our national safety would be in jeopardy. Such policies overlook the likelihood that we rely on foreign production, and our domestic resources remain undeveloped, and we then face the monopolistic practices and price scourging such as occurred in rubber, tin, wool, and other commodities in the past, particularly in that period immediately following the outbreak of hostilities in Korea, when we had that experience. Wool is not a mineral, but it's one of these materials that is not produced in the United States to meet our requirements. I think we produce only 30 percent, but following Korea, when the Armed Forces needed additional woolen supplies for uniforms, in Australia the price of wool doubled within the space of a few weeks.

Too frequently that is the kind of cooperation we get from the countries abroad with whom we are cooperating to preserve a free world.

Those are experiences that the record shows plainly, and we must recognize that—tin, rubber, and it's true with many other minerals.

Now, I want to pay some tribute, as I have already done, to the Paley Commission. I think they have made many recommendations which are timely and which invite support. Of course, I can't go into that in detail, but I would like to mention just a few.

When they recommended complete census of the minerals industry every 5 years; intensified programs for research to improve techniques for exploration of minerals in this country; legislation which is necessary to give financial assistance to small mining operations, and most important, that there be greater efficiency in the use of materials; these are a few of the recommendations.

However, my friends of the mining industry, the keynote of this report is that emphasis should be placed on stimulating production abroad. I cannot agree with the Commission on such a conclusion while our own vast undeveloped deposits remain untouched.

If the United States should become a "have-not" nation dependent upon imports, it will be the result of inept policies which discourage maximum use of American ingenuity and capital in the domestic mining industry. This is no time for a partial or full surrender to the prophets of doom.

And in closing, may I leave this one thought with you? I think we were all inspired by the very appropriate remarks made at the opening of the session this morning by the chief executive of the State of Colorado. I think that he sounded the keynote, as has been mentioned several times, by the chairman of this panel, and I think if we stop, pause at this time, notwithstanding the differences of opinion—and they are only logical and natural as we seek solutions of these many problems facing the mining industry, and yet, we must recognize that wonderful progress has been made in developing our mineral resources, because we have had able, courageous leadership with resourcefulness and vision. During the past century there has been a constant migration, especially from Europe to the United States.

Now, when free government and free enterprise are challenged, shall we reverse that trend? Is the destiny of our Republic dependent upon the expansion of mineral production abroad? Or, shall we reaffirm our faith in our own capabilities and in our own resources and face the realities inherent in national preparedness and in a survival of our way of life?

I agree with Governor Thornton. We must look forward, not backward. [Applause.]

President YOUNG. Thank you very much, Senator. Do the members of the Commission have any remarks to make on the Senator's paper? Any member of the panel?

I want to say one thing about the stockpiling and his reference to that. On these programs, unfortunately we are doing what is set forth in programs, and when the defense authorities and the civilian requirements are met, why we have to quit spending the taxpayers' money, and that is an unfortunate situation, but that's the way we have to function. I hope it will be cured some day.

Mr. BUNKER. It seemed to me that you might possibly have had the impression when the Senator spoke that we disagreed with him in any possible way on stockpiling. We have written about this. The Senator said he had not had an opportunity to read this report. We have an extensive, complete report on stockpiling, and we are quite frank. We say it has been handled very badly. We think they did not buy when they should have been purchasing at low prices. It has had a long history of inadequate appropriations. We think the perfect time is when industry can supply, and we find ourselves in complete agreement.

I thought possibly you might think we were not in agreement, and we are, and so reported in great detail.

President YOUNG. Thank you very much, Mr. Bunker. The next member of our panel who will address you is a man who has spent a number of years in the industry. He was first in the oil industry, later in the lead and zinc industry, and then as editor of the Engineering and Mining Journal, and then in Government service, and now he is back in industry as vice president of Cyprus Mines Corp. It gives me pleasure to present Mr. Evan Just. [Applause.]

Mr. EVAN JUST (vice president, Cyprus Mines Corp., New York City): Mr. Chairman, members of the Commission, ladies and gentlemen, if the mining industry had been progressive enough in the past 10 years to assume a role of objective leadership in solving the public's problems with respect to mineral raw materials, there would have been no need for the Government to set up the President's Materials Policy Commission. Having thus abdicated our duty to society, we should be truly grateful that the Commission's report has been objective, courageous, and nonpolitical. It seems to me that the report, if seen in its proper perspective, is a commendable job and that the critical attitude so common in industry circles is due to a preoccupation with certain details and failure to recognize that the Commission's first duty was to the public, not to us.

My own view is that we should acclaim the Commission for its endorsement of private enterprise, of tax and other incentives, and of a sound concept of conservation. Mind you, gentlemen, these are points over which the mining industry in these American Mining Congress conventions have battled for years, and here we have a complete endorsement of our viewpoint on all those aspects.

Also, it has recommended intelligent revision of our obsolete public-land laws, and has suggested a basis for moderating the painful peaks and valleys of price fluctuation with a minimum of interference with the course of free markets. The thoroughness with which it tackled its job and the stimulating language and illustration of the report are also commendable.

Turning to the particular aspect of the report on which I was asked to comment, namely, its tax recommendations, it should be a source of great satisfaction that the Commission has embraced almost entirely the remaining points of the program toward which the American Mining Congress, the National Minerals Advisory Council and many individuals have worked for many years. With such forthright endorsement of incentive taxation and of percentage depletion from such a source, we can expect a respite from the persistent attacks on percentage depletion which the White House and Treasury have conducted every time Congress has revised the Revenue Code.

Naturally, there will be some inclination within the industry to object to the Commission's recommendations that depletion allowances should not be increased. However, when we reflect that through the years we have defended depletion as a recoupment of capital, I do not see how we can disagree with the Commission's position. I am sure that any historical analysis would show that depletion allowances obtained have exceeded any fraction of income attributable to the resources in their natural state. The fraction thus attributable can be computed by subtracting operating costs, overhead charges and depreciation, plus a reasonable management fee, say 20 percent, from gross income.

Such an analysis will demonstrate that the main fault in our accounting picture is not due to inadequate depletion but to our own failure to demand adequate prices for the liquidation of ore reserves.

No doubt, the affected individuals will violently disagree with the Commission's suggestion that Congress should reconsider the new grants of percentage depletion in the 1951 Revenue Act. However, although it is inappropriate here to discuss the merits of any individual case, I believe that the Commission is on solid ground when it points out that the rates granted under percentage depletion should reflect the difficulty of discovering new deposits. We have sponsored percentage depletion allowances in excess of cost as recoupment of capital and as an incentive to exploration. In either case the appropriate rate should have a relationship to the difficulty of finding deposits of economic significance unless we persist in depleting ore reserves at bargain counter prices.

In recommending that the limitation should be removed on the amount of exploration costs which can be treated as expense, the Commission has sponsored one of the most effective remaining possibilities of stimulating exploration. It is to be hoped that Congress will act on this suggestion as I am sure we all agree that the public interest would be served by an increase in domestic exploratory activity.

The Commission is also to be commended for urging certain new tax incentives toward American investment in foreign mining. The growing needs of our national economy point up very strongly the desirability of commercial control of raw materials we need from abroad.

If Congress adds the tax incentives recommended by the Commission to the substantial ones already embraced within the Revenue Code, it will be appropriate to ask ourselves if there is any reasonable basis for seeking additional tax incentives. I do not see how we can do so on a basis of equity among taxpayers. Thus, the only criterion I can set up is to ask if the level of investment in new mining and exploration ventures is compatible with the public interest, and, if not, are tax or other incentives the more appropriate?

As far as established, profitable mining companies are concerned, it seems to me that the addition of the Commission's recommendations to existing law leaves very little to ask in the way of tax benefits. Mind you, I am not referring to what you might term "technical adjustments" in the tax law which in laws of such complexity will always be a problem.

Further incentives, if there is to be equity among taxpayers, should come out of the prices asked for the output. Considering our newer perspective on the value of depletable raw materials, if the administrators who make decisions for the established producers do not have enough sense or foresight to avoid depleting mineral reserves for inadequate rewards, it will be appropriate for the stockholders to get some new administrators. In other words, it is up to us, not Government, to effectuate the incentives that will maintain a healthy industry. No incentive is more effective than attractive prices for our output.

Considering that the established companies exhibit a preference for letting others conduct exploration in its earlier stages, further attempts to stimulate mineral development should be aimed at reestablishing an army of "small fry" and outsiders eager to tackle the hazards of early-stage exploration. I think we will all agree that on the domestic scene the army which we formerly possessed has dwindled to a mere corporal's guard. Not long ago I believed that this was part of our economic maturity, but since I have had a chance to observe Canadian activity rather closely, I have come to the conclusion that this is only a partial explanation. Canadians and ourselves are very much the same kind of people. It is true that Canadian mining is less afflicted with hardening of the arteries at executive levels, but discounting for that fact, Canadians will attack with enthusiasm a mineral prospect that would be ignored on our side of the border. Also, Canada has an army of "small fry" which is unique in the world today for its numbers and enthusiasm.

Canadian depletion allowances are less than our own. The two features of tax law that seem to me to explain the difference I have noted are that Canada does not tax capital gains and it allows a 3½ moratorium on new mines. Both these incentives are liberally administered.

The Commission considered the moratorium feature but dismissed it as unnecessary and too difficult to administer here. I disagree with this viewpoint on both counts, and I would hope that the members of the Commission might give us some explanation of why the moratorium scheme was found to be unadministerable because it seems to be going along very well in Canada. I personally cannot see enough difference to warrant the Commission's conclusion in that respect.

To restore that indispensable army of enthusiastic outsiders and "small fry" I would recommend both a tax moratorium on new producing properties and a

limited exemption from taxation of capital gains obtained through mineral exploration and development.

Probably these incentives would make the granting of easy prospecting money by Government unnecessary. I might add that that last statement does not indicate an opposition to the last point of view. If we can't get prospecting any other way, I think we should have it that way, but I would still have hope that the particular incentives that I have mentioned would restore that energetic interest on the part of small people and newcomers in early stage exploration.

Thank you. [Applause.]

President YOUNG. Thank you, Mr. Just. Mr. Brown or Mr. Bunker, do you wish to make any reply?

Mr. BROWN. Mr. Just asked why we considered the 3½ year moratorium unadministerable, unworkable. Canada has a population of 8 or 10 million people, and we have a population of 150 or 160 million people, and with all the arguments you get into on old properties with a new contract or a new operation, whether that was a new mine, we could see a lot of difficulties, and that's the reason we dismissed it.

Mr. JUST. It seems to me the answer there has to do with the attitude of the administrative agency toward the industry. The key to Canada's success is administering that feature of the law as well as the capital gains aspect is to resolve the situations, the doubtful situations largely in favor of the taxpayers. In other words, they are incentive minded there, instead of "restrictist" minded, and to me, that makes a great deal of difference in the administration of a difficult law.

Mr. BROWN. That's probably correct, what you say. I can't find an argument.

President YOUNG. Does any member of the panel wish to comment on Mr. Just's statement? If not, the next member of our panel is one of our western mine operators who has been successful in developing a number of small properties into major operations. Ed Snyder, president of the Combined Metals Reduction Co. of Salt Lake City, I think, has done much, if not more than any other one individual in interesting capital in developing the mines of the western Rocky Mountain region.

It gives me pleasure to present Mr. Snyder at this time. [Applause.]

Mr. E. H. SNYDER (president, Combined Retals Reduction Co., Salt Lake City). Thank you, Mr. Chairman. Being down here about eighth on this program, you can understand that most of my stuff has already been peddled directly or indirectly. During the lunch period we tried to settle this controversy out of court, and we made a lot of progress with the members of the Commission.

I find that with my intelligence, which is right average, that I got a lot of ideas out of reading this report that the Commission, that Mr. Bunker, and Mr. Brown tell me that I didn't read carefully enough, and that there is an awful difference between their conclusions, their statements as to what they believe, and their recommendations.

So, I caution you gentlemen in reading the report to be sure that you do not confuse those three things. I will repeat them again: What the Commission believes, but on which they made no recommendations. Items on the report under the heading of "Conclusions." Then items in italics which are definite recommendations.

Now, I would have been far closer to the ideas of the Commission and a lot happier since I first read that report if I had read close enough to have ascertained that there was a very definite distinction between what the Commission believed, what the conclusions were, and what they recommended.

Now, my paper isn't very long, and as I wrote it before I was cleared up on this point that I have just tried to state to you, I am going along with it pretty much, and then apologize to Messrs. Bunker and Brown for being a little bit rough in spots.

On first reading of the report, I felt like the driver of the brewery wagon who was notorious for his unlimited supply of picturesque cuss words. After some boys had pulled the end gate of his loaded wagon near the top of a long hill, he stopped, surveyed the rolling barrels, and to the disappointment of the boys who were hiding in the brush nearby, simply stated, "I can't do justice to the situation." [Applause.]

The speakers ahead of me have given a few facts relating to some of the many good features of the report, and also alerted you to the fallacies that may be hidden in the long-range forecasts of the statisticians and the planners. Human nature being what it is, I certainly was not surprised to find an abundance of well-prepared factual information in the report. Neither was I sur-

prised to find this factual data used as a base for promoting some unsound theories of the global planners.

I am like the bird dog that's been shot at and hit. I may be overly suspicious, and in talking to these gentlemen, I think I was a little bit too much on edge.

I read U. N. and NATO and IMC, and I am just out of Mexico and that conference down there, and the attempt made to put over ITO, all of which, the design and pattern is the same. It's to create a superstate where the boys furnishing 1½ percent of the money and men want to dictate to us furnishing 98½ percent. I tell you they are all of the same pattern, and I may be like the dog that was shot at and hit, and I think maybe I was just a little bit overly suspicious in connection with what the Commission was really trying to do, especially these fine gentlemen who are with us today.

I believe we should be grateful to those whose brains and energy went into the compilation of the report for the sole purpose of presenting comprehensive analysis of our materials and fireplugs, but that we should crush fine, screen dry for accurate sampling the ground and theories planted in the report, especially schemes that would destroy our freedom or the system which has built our great Nation, and that could possibly substitute therefor the controls of a superstate.

Now, I am going to leave that and drop back to some of the things relating to these estimates. Using the definition that ore is mineralized aggregate that can be handled at a profit, ore reserves fluctuate within wide limits of the economic climate. They were seriously decreased by the recent drastic reduction in metal prices. Forecasted reserves in a single mine generally is a difficult task for its engineers acquainted with the property even when fixed costs and prices are assumed, and will continue to be so until man develops instruments superior to anything we now have for determining the extent and grade of underground mineral deposits. I, therefore, have no desire to take your time to analyze in detail the opinions and guesses of those who made the estimates of the world-ore reserves.

However, my experience in operating mines in several districts over a long period of time and an association with men who make estimates warrants my guess that the overall reserves given in the report are probably less than 10 percent of those that can ultimately be mined.

I don't know as I have any quarrel with the Commission on that, but that's my opinion.

The report generated no fear in my mind that the Nation's economy will be seriously cramped for any period in the foreseeable future by shortages of lead or zinc, except those that may be created by unsound activities of government. Even if the consumption estimates for the happy world which I hope we reach in 1975 were realized, I think the Commission did a very good job, considering the task they had in getting some basis for forecasting the next 25 years, and you have all been alerted as to the variations that might be in those forecasts.

They were aimed purely to alert you to the fact that you had better keep track of your raw-material problem. I have no quarrel with those at all. I know there is a wide divergence between the opinions of those who wrote the report and members of industry on this panel as to what are unsound Government policies. From what I very briefly stated, you can readily understand that I am strongly opposed to international agreements that in any way limit our sovereignty, control our production or consumption, or the prices of our products.

Foreign production subsidized directly or indirectly by our Government can ultimately destroy a large segment of our domestic lead-zinc mining industry, and place our economy at the mercy of foreign cartels or governments.

I agree with the Commission that the Nation can ill-afford to condone the violent fluctuation in metal prices such as we witnessed during the past 4 years, and I agree that buffer stocks might be a satisfactory solution to this problem, contrary to what some of my industry friends state. However, these stocks should be national, not international, and operated by regulations spelled out in detail by our Congress and not left to the planners in the State Department or any other Government agency.

In other words, friends, I think that we could define, using a commodity index, modified by the price of labor, that Congress could write a definition that could say at what price they bought metal and at what price they sold it, without having the problems outlined by my friend Simon, and certainly I would not recommend under any conditions to make any agreement that involved international cooperation.

If we look at that problem for what it is, the peninsula of Europe without raw materials, with socialistic governments who, in spite of the low-wage scales,

can't compete with us in the markets of the world, and who were afraid of the Germans, who really want to go to work and do a job, they've got to find some way to get raw materials from us without paying for them what they should pay for them.

One of the problems of the world has been beating down the prices of raw-materials producing countries by virtue of control of markets, and I see in all of these plans a scheme on the part of the European nations primarily to beat down the prices of raw materials, and I say you people who produce metals in the United States have that to look at, at all times.

I have another suggestion to make as to how we might stabilize prices without getting into something where the opinions of men would make it impractical or lead to the disasters pointed out by my industry friends on the panel. Of course, you know this report is strongly opposed to tariffs; that is, it shows it in several places. I call your attention again though that a flexible tariff, established at a level that would permit perpetuation of the domestic industry, that would be a price that would not let every marginal mine operate at a profit, but one set and varied again with the commodity index and the cost of mine labor, would automatically take care of this problem, and not make it necessary for us to periodically shut our mines down, discharge our men, drive them out of the industry, and then get another shortage for our consumers on account of the time required to re-establish production, and we are looking at a picture like that right in front of us at the present time.

Zinc went to 13½ cents today after a drop of 6 cents a pound in about 2 months due to the laws of the jungle that have been used in the zinc market.

I read carefully the fundamental concepts of the report and generally agree with them, but before advocating the less-cost principle, we should have an answer to the question, "Less cost to whom—the American taxpayer or the consumer of metals?"

I am fundamentally opposed to subsidizing consumption. It has fallen down and destroyed every place that it's been tried. The producer should get the subsidy, not the consumer, not the man who gets the benefit of the goods, not the man who uses up and destroys the goods. If we must resort to subsidies, they should be paid automatically to all domestic producers, preferably graduated with increments of production.

The Commission recommends as to loans coupled with collective price contracts provide an unfair type of competition for those who maintain production without Government help, and the domestic industry may soon be seriously hurt by surpluses created by such devices.

Before closing, I urge all domestic miners of lead and zinc to analyze the Paley report and to talk to their representatives in Congress.

President YOUNG. Mr. Bunker, have you any comments to make on Mr. Snyder's statement? Does any member of the panel?

Mr. FLETCHER. In further regard to what Mr. Snyder said, I know he was under a misapprehension, and I think a great many people will be under the same misapprehension when they read the statement such as this on page 90 of the report under the title, "The Commission Concludes." It reads:

"The Commission believes that on balance the international arrangements that hold the greatest promise for stabilizing materials markets and at the same time for promoting the increased production of materials that the future will demand are the multilateral contract type of agreement and buffer stock agreement either without or with quota provisions on exports or production."

I think it would be well if Mr. Brown would explain to us the difference between what the committee means when it says "believes" and what the Commission means when it says "recommends."

Mr. BUNKER. Well, Mr. Chairman, I will say one word, if I may, and Mr. Brown, I think, wants to say something, too.

We have said all the way through the report, and you have to remember that we are dealing with a million-word report. We are dealing with a great many problems to which frankly we did not feel we could bring the issue to any such point as recommendation.

Just to show you how big this report is, my good friend, Mr. Strauss, commented this morning on the international aspects of the report. He tells me, however, that he read only the digest of the international report in the first volume. The expended treatment of that question goes on to say there is an immensely difficult problem, and frankly, we don't know how to cope with it. It's a problem for this sort of Congress or any other group, and I am sure you will all agree that no matter what you have said, that you have a great problem of how best to get at the cheapest level of import of materials.

Therefore, when we finished dealing with that whole subject, about 8 or 10 times as extensive in our full report as appears in the digest, we finally say that the only conclusion we can reach, that the best method—we don't suggest it is a good method, but we suggest it's the best method we know of—is some of these international buffer stocks, multilateral agreements, and then we go on to say very carefully that we think these methods should be explored on a test basis.

Now, that is totally unrelated. You've got to read the treatment and detail of the 50 pages of the difficult subjects, and there are a lot of subjects. We didn't think we were miraculous and could come up with readymade solutions for them, and where we couldn't, we didn't make recommendations. We said it's very, very tough.

That's what Mr. Fletcher brought out. Does that answer the question?

Mr. FLETCHER. I just wanted to bring out that where the Commission says, "We believe," there is a great difference between what they believe and what they recommend. In other words, I felt that when I read the word "believe" they thought that was a good idea. Well now, I gather that there is a question in the Commission's own mind as to whether it is a good idea because they haven't recommended. The only thing that we really have to be worried about are the recommendations which they put in italics, and where they say "believe," that implies it may or may not be a good idea.

Mr. BUNKER. I would like to say one more thing. When we came out and say recommend, this is what we mean. We say we recommend—you do precisely this: You give a man the right of requesting a leasehold or filing a claim. It is clear and precise and it's what we conclude. When we say we don't know how to solve the thing, and this may be the best method, and we think you should explore it, it's a long ways from "You should do something." And we say "explore it on a test case," and I think that's good, clear English and has nothing to do with the recommendations of action otherwise than to explore for test purposes.

Mr. BROWN. I would like to say a word. I think every person who reads this report will find "believe" and "recommend." But you can readily see where you have five on the Commission that you have a lot of differences of opinion, and we wrote a lot of the pages that you are reading, and where we couldn't come to complete agreement, we failed to recommend. We simply said, "We believe," and if you will read the report with that in mind, I think you will see that this controversial thing we have been talking most about today is not a recommendation by this Commission, and we did not in any way intend for it to be a recommendation.

Mr. STRAUSS. I think this has been very enlightening, but in order that the Commission on its part may feel reassured on the question of whether there is any subtlety in the mind of this particular commentator who discussed this problem, I would like to say I do not believe, I do not recommend, and I do not conclude that there ought to be an international buffer stock. [Applause.]

In other words, I believe that our industry should make it amply clear that if there is this difference of opinion in the Commission that this is a dangerous thing. I believe it to be a dangerous thing, whether the Commission wholeheartedly recommends it or just tentatively advances it. It's a far more serious commitment than a tentative exploration.

The first time you try this thing, you are opening the wedge for every nation that might feel it would redound to their advantage, to press hard for similar arrangements in other materials. It's a precedent which, once set, cannot be easily unset, and I think for myself that it should be fought tooth and nail from the outset. The concept of an international buffer stock is an anathema to me.

Mr. Snyder makes an interesting observation, I think, that that recommendation is something which perhaps this group will want to consider as an alternative. I think it's a mistake if all of us take a purely negative attitude on the recommendations, beliefs or conclusions of the Paley commission. I think we have to offer something as an alternative to what they have set forth in their report, and whether Mr. Snyder's plan offers a way out or not in which the industry can concur, I don't know, but I think if we do something to set up a group within this mining congress that will make a continuing study of what the Paley commission has reported, come up with alternatives in which the industry as a whole is generally agreed, I think we will be doing our part of our duty as citizens as well as our duty as mining men.

President YOUNG. Any other member wish to comment? If not, our next speaker is Mr. Donald F. McLaughlin who has served, among many other things, as Chairman of the Advisory Committee on Raw Materials of the Atomic Energy Commission; Chairman of the National Minerals Advisory Committee, a member of the Committee on Natural Resources of the Hoover Commission.

Donald McLaughlin has spent his life in educating people in the mining industry, and in lending his wisdom and efforts in directing the development of the major resources of this country as well as some of the foreign countries.

It gives me pleasure to present Donald McLaughlin. [Applause.]

Mr. DONALD H. MCLAUGHLIN (president, Homestake Mining Co., San Francisco, Calif.). Mr. Chairman and members of the panel, and members of the congress, the turn the discussion took the last 5 minutes reminds me of the mining geologist called upon to testify in court, and he said he believed and would swear to the truth of these geological observations, but wouldn't bet a nickel on their accuracy.

For quite a few years now I have been chiefly involved in the production of a particular metal, and have been very much interested in some of its problems, so you can imagine the shock and the dismay it was to me to read the Paley report and every now and then see in a particularly important place the little phrase, "except gold." Now, why the Paley report should ignore the metal that is our most strategic metal is beyond me, but they did.

You perhaps will pardon my preoccupation with this subject if I will just tell a story that I saw in Drew Pearson's column the other day. It's an old story, and he attributed it to Secretary Acheson, but it will illustrate my point of view.

He told the story of a psychology professor who was making an experiment with a class, and he dropped his handkerchief and let it flutter to the ground, and then he asked one co-ed what it signified to her, and she said, "Falling leaves." He asked another, and she said, "A parachute," and he asked a third, and she said, "Sex," and he said, "Now, that's very interesting, but why does it signify sex to you?" She replied, "That's what I think about all the time."

So, you won't mind and will realize how difficult it is for me not to talk to you a little about gold at the moment.

I will let that go until Wednesday morning, except I would like to say that I was rather surprised that in the Paley report more emphasis was not placed upon the need for an international monetary system based on gold as one of the very best methods of stabilizing international trade, correcting chaotic exchanges and really promoting the ends that we all have very much in mind. [Applause.]

The Paley report performs an important service in directing attention to the major changes that have taken place in the Nation's economy with regard to the production and consumption of raw materials. The significance of the transition from being an exporter of minerals and metals to dependence on imports for a critical part of the supplies needed for our expanding industry is still not appreciated or generally understood. Our thinking with regard to national policies, particularly those dealing with production and international trade, is still dominated by the practices of decades in which we were essentially a debtor nation, maintaining ourselves by the hugh exportable surplus from our mines, smelters, oil wells and forests. Now, after two wars which greatly lessened the competitive positions of the other major industrial nations of the world, we find ourselves in the position of creditor, with a tremendously expanded productive capacity that consumes more of nearly every mineral and metal than even our immense and still growing mining and petroleum industries can supply from domestic sources.

This is a very profound change and one that is likely to require considerable modification of procedures with regard to international trade, tariffs, and mineral policies from those that were satisfactory in the past.

This situation would probably have come about eventually even without the wars, but it would have been a more orderly and slower process, and the discrepancy between our consumption and production of raw materials would have been much smaller and would have arrived much later. But it is with us now, and efforts to appraise it, such as have been made by the Commission, are timely and valuable. In pointing out this situation in a graphic and dramatic way, the Paley report deserves high commendation.

These comments, however, do not imply that I have implicit confidence in the graphs and projections submitted in the report. In fact, I have a chronic suspicion of straight-line charts that purport to show trends based on a record that we know too well to be a most complicated one. Curves of past production of minerals and metals present a most uneven succession of crests and troughs, and any attempt to smooth them out is apt to be influenced by the preconceptions of the smoother. Trends may, of course, be detected, but even trend lines are doubtful if they are straight. The projection of many of them is likely to be

safer if they are shown as flattening curves rather than the steady rise that is predicted in the Commission's report.

Now, I am fully aware that the Commission is saying and emphasizing that these trend lines are simply intelligent guesses.

There is also danger that the exaggerated consumption, or better, destruction, of resources in the current decade of war and extravagance has provided a false concept of normal growth. Indeed, I rather fear that when the rearmament effort becomes less demanding, we may be faced with overproduction of metals and minerals for a time which would be extremely troublesome.

However, these points are not advanced to indicate doubt about the general view of the report, namely, that our growing industries are certain to consume more metals, minerals, and oil than can be supplied from domestic sources and that our dependence on foreign sources for such materials, with a few exceptions, will not only continue but grow.

With regard to the conviction that growth is a basic principle of the American people, I would agree, but with the qualification that growth may take various forms. Bulk of output and consumption is merely one, though it is the measure that is stressed in this report, as it usually is by most American groups. We should be equally mindful, however, that growth may be expressed by improvement in quality and in efficiency, in new discoveries and inventions, in wiser use of available materials and in maintaining a better balanced economy. Unless these aspects of growth are stressed, there is no end of growth ahead, except eventual exhaustion.

With the affirmation of belief in private enterprise as the most efficacious way of performing industrial tasks in the United States, we will surely all agree even though some of us may think that this concept was not consistently followed in all the recommendations of the Commission.

The recommendations with regard to fact-gathering and analysis on the part of the Geological Survey and the Bureau of Mines and on the part of industry through the AIME deserves thought. If kept within reasonable bounds and costs, it could be a useful extension of services now provided. The advisability of a professional society such as the AIME accepting such an assignment is open to serious question, but a committee has been appointed by the Institute to study the matter, and I can assure the members of the Commission it will not be dismissed lightly.

Added support for the Geological Survey is to be commended. Mapping, both topographic and geologic, should be carried on at a faster rate. More district and regional studies of the geology in sufficient detail to be significant in relation to mineral deposits are certainly needed, as well as research in problems of genesis. The recommendation that a special committee be appointed to prepare an inventory of existing scientific and technical knowledge bearing on exploration is to be commended. I believe the National Science Board is giving serious thought to that recommendation at the moment. I would, however, await the report of such a properly qualified group before deciding on any ambitious program of government directed research and development.

The recommendations with regard to the mining laws will undoubtedly arouse intense opposition. However, the mining community should not dismiss them and might even do well to advocate certain of the changes that are proposed. The abuses that exist are attracting more and more attention and if we do not show more inclination to correct them, others may do so in ways that might be far more dangerous than the proposals made by the Commission, or by the Committee on Natural Resources of the Hoover Commission. The subject is a complex one and will undoubtedly be debated at length; and I hope that it will receive the careful and unprejudiced consideration it deserves.

Now, I think the Commission must recognize that when it recommends anything that would extend the leasing laws to the metal mining industry, it's sure to arouse opposition. It's really not because the mining industry could not work under leases, but there is a fundamental distrust of leases on the part of the metal mining community, and probably a great justified fear that they might be used to provide a way for the bureaucrats to get their way in the door by imposing more and more restrictions on the operation of the leases.

I am just mentioning that as one of the prejudices that undoubtedly exist, and there is some justification for it.

The right to hold an adequate area by an exploration permit while prospecting is in progress, the requirement of more formal recording of claims, and a more reasonable definition of discovery particularly for obtaining a patent, seems to me to be points that might be covered in revisions of the law, and I feel

that many of the other recommendations with regard to revision of the law surely deserve our very thoughtful consideration. They certainly should not be dismissed in any light way.

The recommendations on tax policies are excellent and I am sure will be emphatically endorsed by the mining profession. Indeed, it's a matter of tremendous gratification to all of us that the points of view that we have argued for at length are so effectively supported by the Commission.

The Commission's views on foreign investments and international trade are open to many serious objections in my judgment, though in general, I am strongly of the opinion that the interests of the Nation now and in the future would be best served by the gradual elimination of tariffs and other barriers to free trade.

Theoretically and practically high tariffs make no sense to a debtor nation. You have to be paid some way, and the only way in the end we could be paid is in goods. The present system of lending foreign countries or giving them the money to buy our own goods simply means we are paying higher and higher taxes to support that sort of unbalanced and type of trade that cannot go on indefinitely without disaster.

On the other hand, elaborate provisions for scientific and technical studies carried on by agencies of our Government in foreign lands, for financing ventures too risky even for the Bank of International Settlements or the Export-Import Bank to entertain, and for active Government participation in exploration and development of foreign mineral deposits all seem better designed to dissipate American wealth than to attain any significant quantities of metals and minerals at reasonable cost. The control of prices and the negotiation of free market competition by various devices such as international buffer stocks are likewise unnecessarily complicated. Exploration and development of mineral resources by American capital in foreign lands, balanced international trade, and the securing of the desired supplies of metals and minerals from abroad can surely be accomplished in much simpler ways consistent with our concepts of free enterprise. There, I repeat, the international monetary system based on gold would be one of the very best tools we could have.

With the recommendation that stockpiling of strategic and critical materials be made a permanent instrument of the national minerals policy, however, I am in complete agreement. No only does it provide protection against disastrous shortages in case of blockade in time of war, but it also affords one means of increasing our imports without disrupting our domestic economy and thus obtaining some return for the wealth in various forms that we have sent and are continuing to send abroad. The policy of supporting such unbalanced trade through loans, or undisguised gifts, at the expense of the American taxpayer can't go on indefinitely. There is a limit even to our resources, if not to our stupidity. The only way we can be effectively paid is in goods. We don't need many services and the good will we thought we were buying is pretty intangible. Consequently, I see nothing but benefit in the long run to our economy by buying, bringing in, and storing all the mineral wealth we can obtain from others without disrupting the normal economy of friendly nations. The materials should be obtained under reasonable competitive market conditions with proper advantages taken of all factors favorable to us. In fact, I endorse very heartily the things that Ed Snyder said with regard to the national buffer stockpile.

With purchases stepped up when materials are abundant and curtailed when they are scarce, unless when extreme emergency conditions might prevail, and with the stockpiles held inviolate for needs in the distant future, I see no reason to fear that dangerous bureaucratic control of markets would result from such a policy. In the end, we might succeed in building up a reasonable depletion reserve to offset in part the mineral resources we have squandered in the wars and in our fatuous efforts to win friends through gifts without the *quid pro quo* that commands respect. [Applause.]

President YOUNG. Thank you very much. Mr. Bunker or Mr. Brown, do you have any comments, or any member of the panel? Everybody is pleased.

The next member of our panel is the president of the United States Potash Co. He is a member of the National Resources Committee of the Hoover Commission, and served as Chairman of the National Resources Committee of the Department of the Interior. Mr. Horace Albright. [Applause.]

Mr. HORACE M. ALBRIGHT (president, United States Potash Co., New York). Mr. President and members of our panel, and members of the American Mining Congress, and friends, the fact that a potash miner of New Mexico would be the last member of the panel to speak, I hope, will not be taken exception to by many potash people who are here. I don't think it indicates at all that I

am in the situation of the colored man who was a helper to a fellow who had a contract to deliver a load of manure every week to Oak Ridge, the Atomic Energy Plant. I tell the story, of course, because our mineral, 90 percent of it goes into the making of mineral fertilizer.

The man who had the contract drove up each Monday morning with a load of manure on his wagon and on the seat with him was his colored helper. The soldier or guard said, "Who comes here?" He said, "It's me with my load of manure and my nigger." That went on for several weeks, and one morning, just as they approached the gate, the colored man said to the driver of the wagon, "Boss, this week would you mind introducing me first?"

I am not complaining at all at being last. I am rather glad to be here, as you will see, from the message that I hope I am going to be able to get over to you. I think it was a master stroke to start this great convention with this panel discussion of the report of the President's Materials Policy Commission. It was not given this place of prominence because we are afraid of the report of the President's Materials Policy Commission, nor does it receive this distinction in the making of this program because we hold a disagreement. Even Ed Snyder and some of the others have already admitted that we do not disagree with all of it.

We are not here to focus opposition on it with a view of nullifying it or destroying it. I think we are here to analyze it in the light of our knowledge and experience in the mining industry, and to find ways to improve its assembly of facts and revise its conclusions and recommendations. It needs continuing study, revision, and implementation. If we in industry do not find a way to participate in this continuing development of the report, we may find it done for us by Government agencies in a way that will make things worse, not better.

I am sure that even the members of the Commission here, Messrs. Brown and Bunker, will agree with that point.

My own view of the Paley Commission report is that it is one of the greatest accomplishments of a Government agency in many years, certainly since the war. I regard the Commission's report as a repository of facts, really encyclopedic in scope, and of the utmost importance to government, industry, and agriculture, and for years to come. I do not consider it a report for the Government agencies only. I do not think it was compiled from the strictly Government point of view. I believe information and advice and assistance of industry, and especially the mining industry, was honestly and sincerely made available to the Commission, and I believe the Commission accepted and used what it received from industry with appreciation of industry's cooperation and with respect for industry's views and opinions.

I believe in the three fundamental concepts which guided the preparation of the report: First, the principle of growth of our country and its economy; second, the private enterprise as the most efficacious way of performing industrial tasks in the United States, but with recognition of the fact that Government is going to have some hand in guiding, even helping private enterprise, and that we in business not only know this is necessary, but at times ask for it; third, that we are concerned with the affairs of other countries of the world, especially the free world, with their materials, with their trade, and with their standards of living. I believe we are in need of materials of foreign countries, and that these requirements will increase, not diminish. I even think that improvements can be made in the mining laws. This has been discussed by two members of our panel here—Mr. Just and Mr. McLaughlin—the laws and regulations regarding administration of public lands.

Now, it was my intention—and I think it was probably my assignment here on the panel—to discuss the references to these laws and policies in the Paley report, but time does not permit. More importantly, there is ample provision made in tomorrow's program for wide discussion of the mining law and land administration questions. I hope that tomorrow will see just as fine a crowd present as there is today, and that there will be the fullest discussion, not only of the problems that we have here as of today, but also, references to those laws in the Paley Commission report.

I want to see our own mineral supplies increased and our own mining industry grow, flourish, and prosper. I believe these three things will happen, but not fast enough to meet all our needs for metals and minerals. In my opinion, it would be a grave mistake for us to give too much attention to the impact of this report on a year or 5 years from now on our industry or on the economy of the Nation. This is a study of the materials situation for 25 years. The

Commission was charged with the responsibility of arriving at general conclusions regarding our economy 25 years hence in the light of our supply of materials available, and then had to be very objective and could not bring in recommendations that in every respect would seem reasonable to us in the light of our situation today. I say that the Commission has done a magnificent job, written a superb report, a scholarly report, the very language of which commands respect in the reading of it aside from the scope and meaning of its words.

The report becomes at once a basic document certain to influence industry and Government policy for many years to come.

As we have seen today, most, if not all of us here in the panel and in the audience, disagree with some features of the report, especially some recommendations relating to foreign trade policy and Government controls, some phases of Government in industry, but I want to insist that this great report is a fundamental document.

I commend to all of us the editorial in Mining Engineer, the magazine of our Institute of Mining and Metallurgical Engineers. I think many of us have it at home or on our desk at the office, and I am referring to the editorial in the September issue entitled "Don't Let It Die." This fine editorial insists that the Paley report is a starting point, and I quote, "for the formulation of policies which must be continuously revised to meet changing conditions." With this statement, I agree absolutely.

Therefore, I want to urge our officers and directors and our members—especially our officers and directors who have to do with the management and government of this great mining congress of ours—to seriously consider the establishment of a committee, a continuing one with changing membership, but with a consistent policy to study, analyze, assemble more facts, keep the report up to date, also, to suggest revision of conclusions and recommendations as the need arises through new situations and new problems. This committee should be one from our own mining membership appointed by our president, but if that is not feasible, then an outside group of mining men, perhaps like that which was organized, but not under Government auspices, the Mineral Advisory Council, to serve and to do a serious and probably pretty thankless job.

Such a committee should have a special secretariat and small staff which industry and this congress should finance. If we do not do something like this, we will all see Government making strong efforts to apply and enforce features of the report with which we do not agree and with which we have never been in agreement and might never be in agreement, and we will be far more upset about things than they are today.

In conclusion, I say with the editor of Mining Engineer in this September editorial, "Don't let the Paley report die," but in keeping it alive and vigorous and strong, we want something to say about the sustenance it gets. We want a hand in its bringing up. We want to feel when it is 25 years old in 1977, it will be especially strong because we fed it sound mining industry wisdom, year by year.

Thank you very much. (Applause.)

President YOUNG. Thank you very much, Mr. Albright. Do the Commission members have any comment? Do the panel members have any comment on the suggestions made by Mr. Albright in connection with the committee? Mr. Albright?

Mr. ALBRIGHT. I would like to move that you be instructed to send a telegram to the President recommending some such move as was suggested. I will not try to couch the resolution other than to say that I recommend a telegram be sent giving us an opportunity to have a committee appear and discuss the Paley Commission report as it is under discussion.

(The motion was duly seconded.)

President YOUNG. You have heard the motion, and it has been seconded. I think this is a very important move, and I think a very constructive move. If there is no discussion, all in favor will make it known by saying "aye." Ayes? Opposed? The ayes have it. We will proceed to appoint a committee, and I want to say this: That one of the members of the mining industry who has taken a lot of interest in the policies of this organization, who is not present with us today, but who told me yesterday that he had read the 5 volumes while he was up at his fishing camp, and he is a lawyer of some outstanding prominence and an executive in one of the major companies, and he was very frank to say, "While I have read the 5 volumes, I must admit that to know and understand,

you must study the 5 volumes," and this committee's job would be to try to study and find out what the constructive things are which our industry should do to work with this committee.

I want to take a few minutes now to present some of these questions to our panel, and I am sorry we won't have time for all of them, because we have some more program for this afternoon.

The first question I will not submit to the panel. Phil Bradley asks: "What agency and activities of the Federal Government will in the immediate or near future be guided by the Paley report?"

I would say this. As far as I know, the NSRB will make the final recommendations to the President for implementation of it. The final carrying out of the policies will remain to be assigned.

This question I will address to anyone on the panel who can answer it: "How long will it take to complete adequate topographic and geologic map coverage of the United States?" We have two outstanding geologists here. Ira, will you state your opinion?

Mr. JORALEMON. Some of the Geological Survey people say that at the rate at which it is going, it will be somewhere between one or two hundred years.

Mr. MCLAUGHLIN. Of course, that would involve remapping a good deal of the mapping that has been done in the past, so it will never cease.

President YOUNG. Mr. Bunker or Mr. Brown.

Mr. BUNKER. We made an estimate that at the present rate it would take, doing the kind of work that is now being done, 100 to 125 years, and if they followed our recommendations for expediting that, get a good deal of it done on the present basis, in 50 years.

President YOUNG. Any other comment from the panel? I think all of the members of the industry will agree that this is a very important part of the program for the United States Geological Survey to undertake, and I think we should get behind them in urging our Senators and Congressmen to give them adequate funds so that they can use the manpower that they can get that is competent to do this job as quickly as possible.

When you consider that only 11 percent of our country has been mapped and studied carefully geologically, we can see the wonderful possibilities in the other 89 percent.

The next question is by Mr. John Evans, of the State Department: "Do you think that price stabiliation would increase or decrease new private investments in mineral production?" Who wants to answer that?

Mr. SNYDER. I certainly do. What I mean by that is not a fixed price, but a price that would float with the supply and demand within limits controlled by the commodity index and the cost of labor in domestic mines.

I think that one of the worst drawbacks at the present time to do work in the United States is the hectic market that we have had over the last 4 years. A variation of 30 percent in 60 days brings terrific losses to both consumers and producers of metals. In the old days we didn't have that due to the fact that we had a tariff that was one-third of the market price. We haven't anything like that now. We have an insignificant tariff of about 4 or 5 percent. I think that any scheme that will automatically stabilize and that will not require administration by men would be a fine thing for both the domestic and foreign mining.

President YOUNG. Any other comments? Here is a question addressed to you, Ed. "Is the lead picture now or in 1975 black enough to justify further governmental encroachment and/or socialization including the currency involvement in a world buffer stock?"

Mr. SNYDER. The answer is "No." There isn't any shortage of lead and not likely to be.

President YOUNG. Any other comment? Here is a question by Mr. Staub: "Why not let the private metal companies respond to future requirements and leave the Government out of it?" That's a good one. Who wants to answer that?

Mr. BUNKER. We have spoken a million words on it. There are an awful lot of things that private industry will not do, are not doing, and have no intention of doing. Private incentive isn't big. They won't do research work on low-grade manganese. You like to have it under research. They won't put up a million dollars to do it. We say someone should do it to get it done. There is no incentive. We say the minute private industry will take it over, let them take it over, but we want a great many of those things that have to be done and must be done for national security.

Mr. YOUNG. Here is a series of several questions I think the members of the Commission would probably like to answer: "If the Commission looks for high prices and shortages, why does it recommend international agreements and the devices used by foreign nations and cartels to limit production and maintain high prices by eliminating competition?" That is the first question by Otto Herres.

Mr. BROWN. We don't recommend that, any phase of it. He must have read a summary or a summary to get all of this.

Mr. OTTO HERRES. I just read the "beliefs."

Mr. BROWN. I don't believe you did, because there is no place in there where we recommend any 1 of those 3 things you said, none of them.

Mr. HERRES. There is someplace in there where you say you believe—that's what confused me.

President YOUNG. I believe, Otto, that all of us in the industry have been very well rewarded for having had the opportunity of having Mr. Bunker and Mr. Brown here today to explain just what is meant in the various phases of the report. I think it's been a very constructive thing, and I think your questions probably have all been answered in that statement.

Several of the other questions that have been presented here are taken care of in the recommendations and resolutions of the American Mining Congress, and on account of the fact that we have two more papers or discussions this afternoon, I am going to forego the presentation of any more of these questions.

There is one thing, Mr. Brewster, as far as the members of our Commission here are advised, the party you mentioned had nothing to do with the writing of the report. I will make further investigation and advise you personally on that investigation.

I want to say for the membership of our organization that we are appreciative, Mr. Bunker and Mr. Brown, for your coming here; not only that, but we are appreciative of your giving the time that you have given in this very important report, and I also want to thank the members of the panel for the part that they have taken on this discussion today.

Whereupon, the panel discussion of the Paley Commission report was concluded.

A DECLARATION OF POLICY

Western Division, American Mining Congress—adopted at Denver, Colo., Sept. 22–25, 1952

REPORT OF PRESIDENT'S MATERIALS POLICY COMMISSION

The President's Materials Policy Commission has performed a public service in showing how free enterprise has developed American natural resources, in summarizing a vast amount of information pertinent to the mineral industries, and in emphasizing the importance of a consistent mineral policy.

We commend the Commission for:

(*a*) Recommending acceleration of topographic and geologic mapping of the United States and Alaska.

(*b*) Recognizing the principle of percentage depletion for metals and minerals.

(*c*) Advocating removal of the present limitations on the expensing of exploration costs applicable to minerals.

(*d*) Appreciating the necessity of encouraging the participation of American capital in the exploration and development of foreign mineral resources.

(*e*) Recommending that the well-being of small mining enterprises and prospectors be promoted.

It is difficult to reconcile the Commission's endorsement of the free enterprise system, which has created our high standard of living, with its belief "that special consideration should be given to three types of arrangement—(*a*) the multilateral contract; (*b*) international buffer stocks; (*c*) international buffer stocks combined with limited quota arrangements" which are part and parcel of an international plan to manipulate prices, production, and exports for the assumed long-range benefit of the world. The history of domestic and international trade provides ample evidence of the failure of such well-meaning, but misguided attempts at Government and private manipulation.

We strongly urge a return to free enterprise and emphatically oppose a controlled and regimented economy. We are forced to disagree with many of the Commission's recommendations, conclusions and beliefs. Particularly we believe that:

(*a*) Direct exploration activities by Government should not be undertaken on private lands.

(*b*) The mining laws should not be revised to introduce a leasing system for metal miners or abolish extralateral rights.

(*c*) American taxpayers' funds should not be used to explore private lands in foreign countries.

(*d*) A Defense Materials Procurement Agency should not be established as a permanent instrumentality of the Government.

(*e*) Successor Government agencies should not be established when the present emergency agencies are dissolved.

(*f*) Business risks which the Export-Import Bank is unwilling to assume should not be transferred to the American taxpayer.

(*g*) Legislation should not be enacted to furnish Government loans for foreign mineral enterprises, coupled with authorization for Government to enter into management contracts.

(*h*) Permanent legislation should not be enacted authorizing the unilateral elimination of import duties by the executive branch wherever the United States is substantially dependent on imports of metals or minerals.

(*i*) The "Buy-American Act of 1933" should not be repealed.

INTERNATIONAL MATERIALS CONFERENCE

We deplore the participation of the United States in the International Materials Conference and we approve the action of Congress in limiting the representation of the United States on the International Materials Conference to that of an observer.

[From Pay Dirt, a publication devoted to the interests of the Arizona small mine operators, October 24, 1952]

Looking Forward in Mining

AMERICAN MINING CONGRESS SURVEYS NATIONAL POLICIES AFFECTING THE MINERALS INDUSTRY—DENVER CONVENTION OF WESTERN DIVISION IS LARGEST IN ORGANIZATION'S HISTORY

Denver, Colo., became the mining capital of the Nation on September 22 when mining men and allied equipment manufacturers opened the 1952 Metal and Nonmetallic Mineral Mining Convention and Exposition of the American Mining Congress. Total attendance during the 4-day gathering exceeded 6,000.

The convention was described as the most successful in the 54-year history of the organization, with the largest attendance, the most work accomplished, and the greatest machinery exposition ever staged. A spirit of optimism pervaded most of the sessions despite bitter criticism at times of the Government's policies in the fields of labor relations and development of foreign mineral deposits at the expense of the domestic industry.

Merrill E. Shoup, chairman, western division, American Mining Congress, presided at the opening session. Greetings of welcome to Denver and Colorado were extended by Thomas Campbell, acting mayor of Denver, and Gov. Daniel I. V. Thornton of Colorado. Governor Thornton stressed the importance of the gathering by saying that the mining industry holds the key to the progress of the State and Nation, and the key to the future of the Nation and the world.

Howard I. Young, president, American Mining Congress, responded on behalf of the industry. He gave the keynote of the convention as "looking forward in the natural resources industries." Other responses were given by Otto Herres, national chairman of the Program Committee; William J. Coulter, general chairman of the Arrangements Committees; and Charles B. Stainback, chairman of the manufacturers division, American Mining Congress.

PALEY PANEL

The general sessions opened with a panel discussion of the "Paley Commission" report. Two members of the Commission, Arthur H. Bunker, New York, and George Rufus Brown, Houston, led the discussion. Participating in the panel were:

Andrew Fletcher, president, St. Joseph Lead Co.; Simon D. Strauss, vice president, American Smelting and Refining Co.; Ira B. Joralemon, consulting engineer; Senator Henry C. Dworshak of Idaho; Evan Just, vice president, Cyprus

Mines Corp.; E. H. Snyder, president, Combined Metals Reduction Co.; Donald H. McLaughlin, president, Homestake Mining Co.; and Horace M. Albright, president, United States Potash Co.

Bunker opened the discussion with a brief account of the history and objectives of the President's Materials Policy Commission, popularly known as the Paley Commission. When established in January 1951, it was given the task of making an objective inquiry concerning the long-range needs of the country, the supplies available and the demands to be expected. These were to be studied in the light of military security and economic welfare, he said. The Commission selected a time span of 25 years during which it believed no all-out war would occur, but which would experience continued international tension and continued military demands. Conclusions were dictated, he said, by the Commission's belief in the private-enterprise system plus the profits motive with a minimum of Government interference, but with the realization that Government interference can never be set at zero.

Material for the report, Bunker explained, was gathered and cataloged by a staff of 100 individuals with the cooperation of many Government agencies, business concerns, and technical organizations. Additional data were secured through 40-page questionnaries forwarded to some 275 companies. Findings were studied by a review panel and drafts sent to industry representatives.

"A task of such complexity," Bunker sated, "can never be completed and must be carried on continually by industry and Government."

The first speaker for the mining industry was Andrew Fletcher, president of St. Joseph Lead Co. He confined his criticism to the lead section of the report in which the Commission sees an annual lead deficit of 900,000 tons in 1975, deficit being the difference between consumption and domestic mine production plus recovery from scrap.

St. Joe's estimates support a "guess" of a probable 200,000-ton deficit, a reduction of 700,000 tons a year, Fletcher said.

"Whether we or the Commission are even reasonably close to a correct deficit estimate, would be only of academic interest to prove that different figures and assumptions give an entirely changed picture—if it were not for the fact that the Commission's forecast is subject to severe criticism," he declared.

"Furthermore, their 900,000-ton deficit may have frightened them into recommending the adoption of such alien control measures as multilateral Government contracts, buffer stocks, quotas, etc., which if adopted will result in the socialization of the domestic, as well as the world, mining industries.

Regarding consumption, Fletcher said:

"From 1925 to 1950 the population growth was about 36 percent, while lead consumption grew 33 percent. But, for the next 25 years the Commission assumes a lead growth of 61 percent, although they estimate a population growth of only 27 percent. Therefore, using past experience as a base, lead consumption would increase 25 percent, not 61 percent, over the next 25 years. With a present consumption of around 1 million tons, exclusive of stockpiling, the 1975 consumption would approximate only 1,250,000 tons. However, I assure you that we in the lead industry are constantly striving to increase our markets, so I think a consumption of around 1,420,000 tons is probably a more reasonable forecast."

In concluding, Fletcher remarked that a comparison of the Commission's 900,000 tons of lead deficit and St. Joe's 200,000 tons "certainly indicates a wide difference of opinion, and raises doubt in my mind as to whether there may not also be similar great differences of opinion between the Commission and industry on other commodities."

Bunker brushed off the criticisms offered by Fletcher by saying that no one can pinpoint the future, that lead is an isolated case, and that the new uses for lead are going principally into nonrecoverable products; therefore, Fletcher's figures do not have a direct bearing on the case.

Simon Strauss directed his attack to the Commission's recommendations that international buffer stocks be created by the United States and other governments for the purpose of stabilizing raw materials markets.

"A governmentally operated international buffer stock—if undertaken—would hang over the metal markets like a sword of Damocles," he said. "Decisions would be long delayed in the making. While uncertainty over them existed, neither producers nor consumers could plan to operate in a normal way, dreading the possible disastrous financial consequences of misjudging the buffer stock's programs. We would wait in fear and trembling for the result of this monstrous mountain's labors—and when it did come forth I suspect it might well be a mouse."

Strauss declared the buffer stock proposal is advanced by the Commission on the theory it is difficult for private capital to operate in a market in which prices fluctuate widely. "It would be intolerable, however," he asserted, "for private capital to work in a climate in which the entire investment is in constant jeopardy because of potential political decisions of an organization responsible to no single nation or to no single group of stockholders."

All efforts in the past at international controls over raw materials have been a failure when these efforts have been made by private cartels, he concluded, and the substitution of politicians for industrialists does not make the cartel theory any more palatable.

In the exchange of comments and questions following this paper, Bunker stated that the Commission realized the hazards involved in buffer stocks, so had said to explore the proposal on a single test basis. Strauss replied that he did not believe exploration was worth the effort, particularly since in this country we have the record of exploring a plan only to find that it has become permanent.

Ira Joralemon criticized the report because its underlying theme is that the United States has become a have-not Nation, one that must rely on other parts of the free world for an increasing proportion of its raw materials.

"The fact is, rather, that the world is a have-not world," he explained. "All parts of it must rely on trade with other parts for a large portion of the raw materials or commodities needed for a high standard of living. We are no exception, but we are more favored in raw materials than any other nation or area."

He pointed out that America's problem is not one of insufficiency so much as it is "reckless prodigality" that no source of supply could keep up with.

"If the rest of the free world approached our living standards, consumption of mineral raw materials would increase six times," Joralemon said. "There isn't any such supply in the world."

He pictured the situation as leading inevitably to "increasing hatred toward us by all the people that are falling behind us in the race for greater comfort and material security."

It can result, he said, only in an eventual war "in which we will be the lonely fat boy with a big stick of candy, surrounded by hungry toughs."

Joralemon maintained that the statistics on domestic consumption of most of the vital raw materials show curves which are already beginning to flatten; yet the forecasts in the Paley report pay no heed to this tendency. In copper, for instance, the Commission's forecast assumes a continually steepening curve for the next 25 years.

"The fantastic domestic use of the principal raw materials foretold by the Commission is best illustrated by the fact that in the next 25 years they think our population will increase by 27 percent, while our consumption of vital materials will increase by 50 or 60 percent," Joralemon continued. "In contrast with this explosive domestic use, the Commission forecast for increase in foreign use of most materials is comparatively moderate."

These estimates were made, he said, despite the fact that the so-called backward nations—including our Latin American friends—have hardly started their march toward a standard of living that we would scorn. The case of copper was cited as an example. Whereas the United States now uses 23 pounds of copper per individual per year, and is expected to increase its use by 2.9 pounds per individual by 1975, the backward friendly nations now use only a third of a pound of copper per individual per year, and their consumption is supposed to increase by only one-quarter of a pound in the next 25 years.

"In an age in which the resurgence of the backward nations almost amounts to a revolution," he asked, "how can we expect to keep their friendship if we dole out to them mere pittances of their own resources?"

In concluding, Joralemon said:

"Perhaps the worst feature in the worldwide planning that is advocated by the Commission is the self-satisfied claim that it is based on 'enlightened self-interest.' Enlightened self-interest is just a fancy phrase for selfishness you think you can get away with. If we are not willing to allow the rest of the world to catch up with us in living conditions, let us at least not make this greed a matter of avowed public policy."

Senator Dworshak, of Idaho, described the Paley report as being a stimulating factor in the whole materials field, but declared that "many of the conclusions reached by the Commission are illogical and highly discriminatory," and would place our domestic mining industry at a serious disadvantage in contributing to

national defense. He expressed the fear that Government agencies may arrogantly attempt to implement these recommendations, even before Congress can consider them.

His principal criticism was directed toward the "preferential treatment for the development of mineral resources abroad."

"Why should the Government stimulate expanded production of scarce minerals abroad," he asked, "while discouraging use of dependable sources at home? In case of global war, foreign shipments might be blocked, and then we would be entirely dependent upon domestic production. If the latter has been neglected, and the essential minerals are not available, our national safety would be jeopardized."

This policy and the Paley recommendation, he said, overlook entirely the likelihood that if we rely on foreign production, and our domestic sources remain undeveloped, "we face the possibility of monopolistic practices and price gouging, such as occurred in rubber, tin, wool, and other commodities in the past."

Dworshak charged that the State Department had circumvented Congress deliberately in setting up the International Materials Conference, and was furnishing funds to foreign nations so they could buy scarce materials on world markets for higher prices than the OPS prices in the United States.

He commended the Commission for its recommendations concerning a 5-year census of industry, for intensified research, greater efficiency in administration, and assistance to small mines.

"If the United States should become a have-not nation dependent on imports," he concluded, "it will be the result of inept policies which discourage maximum use of American ingenuity and capital in the domestic mining industry."

Tax recommendations of the Paley report were commented on by Evan Just.

"It should be a source of great satisfaction," he said, "that the Commission has embraced almost entirely the remaining points of the program toward which the American Mining Congress, the National Minerals Advisory Council, and many individuals have worked for many years. With such forthright endorsement of incentive taxation and of percentage depletion from such a source, we can expect a respite from the persistent attacks on percentage depletion which the White House and Treasury have conducted every time Congress has revised the Revenue Code."

Regarding percentage depletion, he said that a careful analysis will demonstrate that the main fault in the industry's accounting picture is not due to inadequate depletion allowances, but to a failure to demand adequate prices for the liquidation of ore reserves.

"In recommending that the limitation should be removed on the amount of exploration costs which can be treated as expense, the Commission has sponsored one of the most effective possibilities of stimulating exploration," Just continued. "It is to be hoped that Congress will act on this suggestion as I am sure we all agree that the public interest would be served by an increase in domestic exploratory activity."

Just compared mining activity in Canada with that in the United States, commenting that "Canadian mining is less afflicted with hardening of the arteries at executive levels," and that Canadians "will attack with enthusiasm a mineral prospect that would be ignored on our side of the border." To reestablish an army of small-fry and outsiders eager to tackle the hazards of early-stage exploration, he recommended a tax moratorium on new producing properties and a limited exemption from taxation of capital gains obtained through mineral exploration and development.

E. H. Snyder's talk brought up a discussion of the terms "believe" and "recommend" as used in the Paley report. According to George Brown, Commission member, the words "we believe" were used when complete agreement could not be reached; "we recommend" was used when the course to be taken was undisputed.

"Human nature being what it is," stated Snyder, "I was not surprised to find an abundance of well-prepared factual information in the Paley report. Neither was I surprised to find the factual data used as a base for promoting many unsound theories of the global planners and power-hungry politicians. * * * I believe we should be grateful to those whose brains and energy went into the compilation of the report for the sole purpose of presenting comprehensive analyses of our materials and power problems, but we should crush fine and screen dry for accurate sampling the propaganda and theories planted in the report by the planners."

Snyder estimated that the overall reserves given in the report are "probably less than 10 percent of those that can ultimately be mined." Therefore, the

report generated no fear in his mind that the Nation's economy will be seriously cramped for any extended period in the foreseeable future by shortages of either lead or zinc, "except those that may be created by unsound activities of Government."

Foreign production subsidies, directly or indirectly by our Government, he explained, can ultimately destroy a large segment of our domestic lead-zinc mining industry and place our economy at the mercy of foreign cartels and governments.

While acknowledging that buffer stocks might be a solution to violent fluctuations in metal prices, he maintained that these stocks should be national and not international. Flexible tariffs to automatically maintain, within reasonable limits, the price level necessary for a healthy domestic mining industry would be more satisfactory to the taxpayer, he said.

"Before advocating the least-cost principle, we should have an answer to the question of the least cost to whom: the American taxpayer or the consumer of metals? I am fundamentally opposed to subsidizing consumption," Snyder asserted. "If we must resort to subsidies, they should be paid automatically to all domestic producers, and preferably graduated with increments of production."

Donald McLaughlin commended the report for its recommendations concerning more intensive geological mapping of the United States and Alaska and for a better inventory of our national resources, as well as for its tax recommendations which were described as "splendid." He opposed the extension of the leasing system to metal mines, but suggested that the industry might do well to correct the mining laws to meet growing abuses rather than leave to others the changes which could be most damaging.

He expressed shock and dismay to see the subject of gold completely ignored, and suggested that an international monetary system based on gold would aid the Nation in reaching the goal we all desire.

McLaughlin described the exploration of foreign mineral deposits with Government funds a dissipation of American capital, then commented: "There is a limit to our resources, if not to our stupidity."

The last speaker on the panel was Horace Albright. He proposed the establishment of a permanent committee of mining men within the American Mining Congress to work with and keep alive the Paley report. His motion that President Truman be asked to name such a committee was adopted by the convention.

RESOLUTION ON PALEY REPORT

At the close of the panel discussion the convention adopted the first of a series of resolutions setting forth the mining industry's views. A long list of alterations was urged in the Paley recommendations.

Particularly objected to was the Commission's "endorsement of the free-enterprise system" while, at the same time, recommending such "international Government control devices as the multilateral contract, international buffer stocks combined with limited quota arrangements."

These, the resolution asserted, "are part and parcel of an international plan to manipulate prices, production, and exports for the assumed long-range benefit of the world. The history of domestic and international trade provides ample evidence of the failure of such well-meaning but misguided attempts at Government and private manipulation."

The resolution urged a "return to free enterprise" and emphatically opposed a "controlled and regimented" economy. In disagreeing with many of the Commission's recommendations, the mining congress stated its belief that:

Direct exploration activities by Government should not be undertaken on private lands;

The mining laws should not be revised to introduce a leasing system for metal miners or abolish extralateral rights;

American taxpayers' funds should not be used to explore private lands in foreign countries;

A defense materials procurement agency should not be established as a permanent instrumentality of the Government;

Successor Government agencies should not be established when the present emergency agencies are dissolved;

Business risks which the Export-Import Bank is unwilling to assume should not be transferred to the American taxpayer;

Legislation should not be enacted to furnish Government loans for foreign mineral enterprises, coupled with authorization for Government to enter into management contracts;

Permanent legislation should not be enacted authorizing the unilateral elimination of import duties by the executive branch wherever the United States is substantially dependent on imports of metals or minerals;

The Buy American Act of 1933 should not be repealed.

In another resolution the congress urged that Government agencies afford domestic mines at least the same price and other considerations and advantages given to foreign production. If price controls are to be continued, the resolution stated, amendments should be made to provide that no price ceiling on domestic products shall be less than the price at which comparable products produced abroad are permitted to be sold within the United States.

Concerning small mining, the resolution stated:

"The continued operation of prospectors and small mining concerns is important because these smaller operations provide a pool of specialized knowledge and trained manpower available for the expansion of minerals in the event of an emergency. Their activities are the source of new mine discoveries of consequence."

DEFENSE MINERALS PROGRESS

Howard I. Young, in his role as Deputy Administrator, Defense Materials Procurement Agency, reported on the progress in the Government's raw materials program.

Sharpest criticism, he said, had been directed toward the lead program under which authorization was given for the purchase of 30,000 tons of lead during a period of easing demand and falling prices.

PUBLIC LANDS PANEL

Senator Arthur V. Watkins, of Utah, served as moderator of the public lands panel. Two general statements from the Paley report were made the basis of the panel discussion:

1. The mining laws in their present form directly impair the public interest; and

2. The mining laws obstruct private mineral exploration and development.

The proposed changes in the mining laws reflect the difference in the philosophy of the framers of the mining law and those of the present administration. Watkins explained. "The mining laws were designed to encourage individual development and ownership of our mineral lands. * * * The philosophy of the present administration is premised on the Government's retaining ownership of public lands, and permitting multiple use of the surface by individual citizens upon a royalty and rental basis."

In his opinion the proposed changes in the underlying philosophy of our present mining policy would seriously affect the tax income from public land States in all future mining developments.

"To realize just what this might mean in the future, consider the tax incomes the States of Utah, Montana, and Arizona are now receiving from their mammoth copper mines which they probably would not receive if these operations were on a lease basis."

A. O. Bartell, managing engineer, raw materials survey, Portland, Oreg., was the first panel speaker. He reported that the organization he represents made a considerable investigation of the alleged "land grabs" in Oregon, used by the Bureau of Land Management as the basis for demanding sweeping changes in the mining laws.

"It is our conclusion," Bartell stated, "that the Bureau of Land Management's campaign is deliberately promoting discord among the natural resource based industries—and apparently for no other purpose than to remove mineral-lands development from the jurisdiction of the courts and into the bureau's 'permittee' and 'multiple use' system. We found that the 'land grab' had been greatly overplayed, misleadingly presented, and that actual 'grabs' were well within the legal power of the Bureau of Land Management to prosecute."

Bartell briefly related the history of the Oregon and California lands to show what can happen to our basic mining laws "when even a small crack is left in the door." These lands were closed to mineral entry by an edict of Oscar L. Chapman, then Assistant Secretary of the Department of Interior, and only opened on a limited basis after a 7-year battle on the part of the mining fraternity and those interested in Oregon's industrial development.

This unhappy experience demonstrates, Bartell claimed, that the "Interior Department has the apparent goal of complete control of all public lands under

.ts jurisdiction. The present mining laws have been interpreted and delineated by the courts ever since 1872, but the moment some change is made in the law that is not backed by ample court precedent, we open ourselves to law by administrative interpretation which is not referable to the courts."

Representative Wesley A. D'Ewart, of Montana, a member of the House Subcommittee on Mines and Mining, advised that, in correcting any abuses of the mining laws, extreme care be taken "not to destroy the system under which we have established an industry which has added immeasurably to the growth, the well being, and the security of our country."

D'Ewart said that during his years in Congress he had listened to many discussions of the present mining laws, their abuses and proposals for improvement. However, no one "had made a point that these laws were unduly restrictive or that they hindered the development of mineral resources." He believed the demand for change had come from outside the industry—from persons not well versed in the difficulties of, or need for, mineral production.

He suggested that an addition to the mining laws might encourage exploration. "Geophysical search, exploration from the air, and other new techniques in our modern-day search for subsurface or concealed deposits require large investment and are generally applicable to a considerable acreage," he explained. "A new section to the present mining laws which would encourage these new methods of prospecting would appear to be in the public interest."

The "very real and crucial problem" which faces the uranium miners on the Colorado Plateau was discussed by Wayne N. Aspinall, Member of Congress from Colorado. In this case, previous leases for oil and gas have "withdrawn" the area for location or development of other minerals. Therefore, the miner cannot make a valid location and the Atomic Energy Commission will pay no bonus for uranium from claims clouded by previous oil and gas leases. To meet this difficulty, Aspinall suggested a change in the mining law to provide an alternative to location for the acquisition of metalliferous ores.

R. B. Holbrook, attorney of Salt Lake City, confined his paper to four changes in the mining laws proposed by the Paley report: the increase in the annual labor required on unpatented claims from $100 to $250; the increase in improvements required for patenting from $500 to $1,250; the recording of all unpatented claims, adequately described, with the Department of the Interior (and failure to so record existing claims within 3 years would constitute abandonment); and the separation of surface and subsurface rights. None of these changes, he said, would facilitate development of our natural resources.

"The purpose of the filing is to give the Bureau of Land Management a record of all land held under mining claims. This is desirable if it could be done without interfering with the location of mining claims, but in my opinion it cannot be accomplished without materially interfering with such locations and without changing the whole fabric of our mining laws," asserted Holbrook. * * * "Assuming that an adequate description may be recorded, it still cannot be determined in the land office whether the location is good or bad. Validity depends on facts, not records. The basic and fundamental concept of our mining laws makes both the question of valid initiation and maintenance of rights under a mining location dependent upon factual questions which can be answered only by an examination in the field."

The proposal to separate the surface and subsurface rights is based on the premise that there should be multiple use of the surface of public lands, he said, yet sound practice generally requires that valuable facilities be erected on land owned in fee and any such limitation in surface rights would restrict and may prevent installation of such facilities.

There is nothing in the Paley report to justify the changes proposed, or to indicate a need for them, stated Robert M. Searls, attorney-at-law, San Francisco, the last panel speaker. He maintained that proper enforcement of existing laws would eliminate the "abuses" cited, and that the changes in most cases would create additional litigation.

A spirited question-and-answer period followed the panel presentation, after which the convention adopted its public land policy resolution. The resolution said, in part:

"We have examined these proposals (of the President's Materials Policy Commission) and the statements on which they are based. We concluded that they are based on the socialistic concept that public lands containing minerals must be disposed of under terms as will insure not only a direct royalty to the Federal Government on production, but also its strict control of the miner's operations. We oppose this concept in its entirety and adhere to the sound policy

under which our mining laws are framed and have worked successfully. Multiple uses of the surface by miners, timbermen, stock grazers and resort holders are impracticable and even in theory could exist only under the most intensive bureaucratic regulation.

"The courts and our present judicial system have been found adequate to protect the public * * * against illegal and fraudulent appropriation of public property. We demand that the Bureau of Land Management and Department of Justice utilize these judicial procedures in fraud cases.

"We express our unalterable opposition to the substitution of a leasing system for the present mining laws and to the amendments proposed in the report.

"We recognize that there have been abuses of mining claim locations which have invaded the rights of others * * *, but we believe the Bureau has deliberately created a chaotic situation which seems to require consideration. Therefore, we urge that an attempt be made at local levels by interindustry discussion with other users of public lands, with a view to cooperating and presenting a united front on conditions which will eliminate the abuses.

"We oppose any moratoria on annual labor requirements."

SURVEYING IN THE BIG STOPE—WHERE THERE'S SOME ORE MIXED WITH A LOT OF WASTE

PALEY REPORT IS UNDER FIRE

Now that some, at least, of the Paley report has been digested by the mining industry, various critical analysis of its "facts" and figures are being published. It appears that the crystal ball dated 1975, which revealed the future so clearly to the Commission's staff and members, was slightly cracked and cloudy in spots.

HOARDING RESOURCES NOT GOOD POLICY

The Paley report, without question, contains a vast amount of information which will be of great value to the mining industry. In some instances there are real nuggets of common sense, such as the following:

"Hoarding resources in the expectation of more important uses later involves a sacrifice that may never be recouped; technological changes and new resource discoveries may alter a situation completely. It may not be wise to refrain from using zinc today if our grandchildren will not know what to do with it tomorrow."

This point of view has been expressed in Pay Dirt many times in the past.

[From the Engineering and Mining Journal, September 1952]

THERE'LL BE SOME CHANGES MADE

This is the month when the American Mining Congress meets once more, argues the merits of various points of view, and passes a set of resolutions that will express, as well as anything can, the majority opinion of the mining industry.

The resolutions probably won't differ much from those passed 2 years ago at the equivalent meeting of the AMC in Salt Lake City, although they will stand in marked contrast to those of say 20 years ago. Don't let the surface similarity fool you. The industry that presents them is not the same as the industry of 2 years ago. In technology, character of management, breadth of interests, and economic climate, changes are taking place that are going to stir the industry to its roots over the next few years. Let's consider them in the four groups mentioned.

Changing technology puts the mining industry for the first time into a rank near that of the chemical industry for opportunities for rapid advancement. The expanding chemical industry has been forcing young men up the ladder rapidly. It is happening in mining, too. A young fellow called up the other day to tell us he was leaving to run a new metallurgical plant being set up out in the Midwest. A new process created the opportunity for him.

New processes are opening new jobs and new opportunities right and left. That's only part of the story, however. In every branch of mining, there are new opportunities for young men trained in the modern and, to us, incredible techniques of science today.

This, in part at least, accounts for a gradual shift in the character of mining management. When our editors travel through mining districts today, more and

more frequently they meet men in their thirties and forties as superintendents and managers.

These new managers don't try to substitute a shout and a hard fist for cool thought and a wise, firm decision. They study management as a technique; they are receptive to new ideas. Given sound assistance from top management, where long experience counts, this younger management group is going to give mining a shot in the arm.

The growing breadth of interest, as more mining companies enter the petroleum field, will teach mining that young ideas can pay off, as they have in the petroleum industry. There may be gray beards (if they let they grow) among the Standard Oil of New Jersey management, but there's no gray-beard thinking there.

The one outstanding example of how the oil people have far eclipsed the mining industry performance is in exploration. We know some individuals in mining who have done excellent jobs in finding new orebodies or in cutting exploration costs, but we know of no effort, or even attempt at an effort, to achieve industrywide cooperation on research to develop exploration methods to locate blind, deep-seated orebodies. Such methods as we do have were invented or developed largely by or for the oil companies.

There are glimmerings of serious thought on this point in several quarters in the industry, and a longer contact with the fast-working methods of the petroleum people should bring them into focus. Of course, the Paley report, summarized in this issue, is quite specific on this point.

The Paley Commission's report sketches pretty clearly the economic shape of things to come, if we want it that way. On this matter of exploration, the report suggests that Government take the initiative in financing research to improve existing geophysical methods and develop new ones. The work would be done in university or Government laboratories. There didn't seem to be much thought given to industry laboratories.

Other parts of the Paley report are even more significant. There are going to have to be changes made in the methods of locating and holding claims. The old ways are running into situations they can't handle; geophysical prospecting, for example.

What is true of the land laws is true of many more of the customs and attitudes the mining industry has held for years. We don't, for a minute, hold that the Paley report is a complete blueprint for action. We dislike some of its proposals intensely. We do wish to point out, however, that the Paley report gives you an excellent idea of the way the trend of the times is headed. Also, it gives it to you in time for you to do something about it, if you want to.

Therefore, entirely apart from certain changes we hope will be brought about by a time-honored expression of public opinion of early next November, we look forward to a livelier and more exciting period than mining has known in years. As that old blues song put it, "There'll Be Some Changes Made!"—and about time, too!

[Editorial from Mining Engineering, September 1952]

Don't Let It Die

There have been two important accomplishments of the Truman administration; the Hoover Commission report on inefficiency and waste in Government and the report of the Paley Commission on the natural resources of the United States. Both reports are in the interest of the American people and should transcend the boundaries of political parties. Both reports are starting points for the formulation of policies which must be continuously revised to meet changing conditions. Regardless of the outcome of the election the principles embodied in these two great documents must be kept alive.

The Paley report is right in our own bailiwick of mineral raw materials and it behooves us to study it carefully as our responsibility to posterity. To those in the mining industry who have limited their field of observation to moving rock or to metal prices it may come as a surprise that our production of such staples as copper, lead, and zinc has fallen behind increased requirements to the point that substantial tonnages must be imported. Iron ore is next on the list and everybody knows that such metals as tin, tungsten, chromium, manganese, nickel, and cobalt are imported almost exclusively. The crisis in raw materials pointed up by the Paley report has been reported annually by Elmer Pehrson and others to small gatherings at the Mineral Economics Division ses-

sions at the annual meeting for as long as we can remember. In September 1949, the United Nations Economic and Social Council held an international resource conference at Lake Success which disclosed these same grave conclusions:

Consumption of raw materials is multiplying at an alarming rate, faster than discoveries or replacements are being made.

Production has been wasteful and utilization lavishly beyond engineering and practical requirements.

Industrialized nations are depleted and many raw materials consumed by industry are not found in the industrialized countries.

Nations formerly exporters of raw materials are increasingly building their own consuming industries.

Political forces in the world are limiting access to raw materials.

The Paley Commission selecting the quarter century, 1950 to 1975, to project raw-material requirements for the United States, pointed out obstacles to meeting these requirements and made recommendations for procurement. It is not important that we disagree that cobalt consumption will reach 344 percent of present, or fluorspar 187 percent when iron and ferroalloys are only expected to increase 75 percent. What is important is that the fabulous appetite of the United States for mineral raw materials has consumed more since World War I than was consumed by the entire world in all recorded history prior to 1914. And, unless the people of the United States are satisfied to remain at their present standard of living (which is unthinkable) this consumption is correctly plotted by the Paley Commission as continuing to expand.

If the United States is to continue on a course of progress, it must procure raw materials wherever it can at the lowest possible cost. Natural resources are clearly an area in which the broadest cooperation between industry and Government must exist to achieve efficient exploitation, economic consumption, and expansion of sources of supply. The message of the Paley report requires action comparable to that of the North Atlantic Pact. Its implication is as significant as military preparedness. It is a world problem. It is a mining engineering problem. Don't let it die.

[From the Wall Street Journal]

METALS DISPUTE—PALEY REPORT RECOMMENDATIONS HIT BY TWO LEADING MINING OFFICIALS

DENVER, Colo.—Two of the Nation's major nonferrous mining enterprises yesterday emphatically disagreed with recommendations and forecasts of President Truman's Material Policy Commission—the so-called Paley report.

This Commission, headed by William S. Paley, chairman of the Columbia Broadcasting System, issued its report recently forecasting by 1975 there would be tremendous increases in consumption of metals—lead, copper, zinc, among others—and dire shortages. It recommended world multilateral government contracts, buffer stocks, quotas, and a host of other ideas.

Andrew Fletcher, president of St. Joseph Lead Co., the country's largest individual mine producer of lead, took strong objection to the Commission's report that United States lead consumption by 1975 would be 1,950,000 tons and domestic production from mines and scrap would be only 1,050,000 tons—a deficit of 900,000 tons that would have to be made up by imports. The Commission figured on a United States mine output of 300,000 tons in 1975 and 750,000 tons recovered from scrap lead.

The St. Joe president estimated that 1975 lead consumption would be about 1,420,000 tons figured on a per capita consumption of 15 pounds and the 193 million population anticipated by the Commission by that year.

The mining official went on to say that United States production of lead by 1975 would total about 1,225,000 tons—375,000 tons from domestic mines and 850,000 tons recovered from scrap. That would be a deficit of only 200,000 tons as compared with the Commission's estimate of 900,000 tons—a difference of 700,000 tons.

Mr. Fletcher made his remarks before a panel discussion of the Paley Commission held yesterday at a gathering of the American Mining Congress, the industry's national organization.

He said, "A comparison of the Commission's 900,000 tons lead deficit and St. Joe's 200,000 tons, certainly indicates a wide difference of opinion, and raises doubt in my mind as to whether there may not also be similar great differences of opinion between the Commission and industry on other commodities." He

indicated the 900,000 tons deficit may have frightened the Commission into recommending the adoption of worldwide governmental controls "which, if adopted, will result in socialization of the domestic, as well as the world mining industries."

Simon D. Strauss, vice president of the American Smelting & Refining Co., attacked the Commission's recommendations that international buffer stocks should be created by the United States and other governments for the purpose of stabilizing raw-materials markets.

"A governmentally operated international buffer stock—if undertaken—would hang over the metal markets like a sword of Damocles. Decisions would be long delayed in the making. While uncertainty over them existed neither producers nor consumers could plan or operate in a normal way, dreading the possible disastrous financial consequences of misguiding the buffeer stock's programs," he said.

"We would wait in fear and trembling for the result of this monstrous mountain's labors—and when it did come forth I suspect it might well be a mouse," he added.

Mr. Strauss declared the buffer stock proposal is advanced by the Commission on the theory it is difficult for private capital to operate in a market in which prices fluctuate widely. "It would be intolerable, however," he asserted, "for private capital to work in a climate in which the entire investment is in constant jeopardy because of potential political decisions of an organization responsible to no single nation or to no single group of stockholders."

"All efforts in the past at international controls over raw materials have been a failure when these efforts have been made by private cartels; the substitution of politicians for industrialists does not make the cartel theory any more palatable."

Among the many problems of international buffer stocks, he added, is the problem of currency. The weak currency soon would drive out the strong, and the buffer stock may find itself with most of its working capital, after a time, in one foreign currency with most of its purchasers to be made in another, Mr. Strauss declared.

Concerning the Commission's statement, the aggregate cost would not be so great as to overtax the resources of the participating countries, Mr. Strauss guessed the amount would be at least as great as the United States stockpile effort—now estimated at over $9 billion. And he believed the resources of the participating countries are already overtaxed without any buffer-stock schemes.

A more serious objection is the improbability that fifty-odd nations which will be involved in the management of the buffer stocks can be brought together to operate in an effective or prompt manner, he said.

Along this line, he cited the failure of the International Tin Committee after 6 years of interchanging ideas to reach any conclusive agreements.

Mr. Strauss also called attention to long-drawn-out deliberations of our own Government concerning Bolivian tin, Chilean copper, and many other minerals. "When a decision is finally reached, the situation frequently has altered radically and a policy that may originally have been sound is no longer applicable," he said.

[From the Denver Post]

DRASTIC U. S. POLICY CHANGES ADVOCATED BY MINING CONGRESS

(By Robert W. Fenwick)

Drastic changes in the Nation's long-range mining policy as outlined by the President's Materials Policy Commission, were being sought Tuesday by the American Mining Congress.

The congress adopted resolutions Monday which called for mine price and tariff protections, alteration of the stockpiling plan to give greater benefits to domestic producers, and sought a more active part in formulating the Nation's mining policy.

The congress was highly critical of some phases of the so-called Paley report by the President's Materials Commission, then called for appointment of a committee to work with the Commission to effect revisions to meet changing conditions

One resolution termed the suggestions for international "buffer stocks, limited quotas, and multilateral contracts, part and parcel of an international plan to

manipulate prices, production, and exports for the assumed long-range benefit of the world." It continued:

"The history of domestic and international trade provides ample evidence of the failure of such well-meaning but misguided attempts at Government and private manipulation."

The resolutions were approved over claims by two members of the President's Commission—Arthur H. Bunker, of New York City, president of Climax Molybdenum Co., and George R. Brown, of Houston, Tex.—that the body did not recommend the features but merely suggested that they be tested.

FUND USE HIT

The Mining Congress voiced specific opposition to:

1. Government exploration on private lands.
2. Use of tax funds to explore foreign mineral lands.
3. Permanent establishment of the defense materials procurement agency.
4. Establishment of successor agencies when present emergencies are dissolved.

It declared:

"The mining laws should not be revised to introduce a leasing system for metal miners or abolish extralateral rights.

"Business risks which the Export-Import Bank is unwilling to assume should not be transferred to the American taxpayer.

"Legislation should not be enacted to furnish Government loans for foreign mineral enterprises, coupled with authorization for Government to enter into management contracts.

"Permanent legislation should not be enacted authorizing the unilateral elimination of import duties by the executive branch wherever the United States is substantially dependent on imports of metals or minerals.

"The Buy-American Act of 1933 should not be repealed."

POLICY GROUP LAUDED

The congress patted the materials policy group on the back for urging faster topographic mapping of the United States and Alaska; recognizing the principle of percentage depletion for metals and minerals; advocating removal of limitations on the expensing of exploration costs applicable to minerals; appreciating the necessity of encouraging American capital in exploration and development of foreign mineral resources, and recommending that the well being of small mining enterprises and prospectors be promoted.

"REALISTIC PROGRAM"

Full cooperation of the Government in establishing a realistic minerals program was urged by the mining men on the opening day of their 4-day conclave in Denver's city auditorium.

"We urge that Government agencies afford domestic mines at least the same price and other considerations and advantages given foreign production," one resolution declared.

The congress also recommended that no withdrawals from stockpiles of critical materials be made except in declared emergencies when the national security clearly requires release of a particular material.

TARIFF BACKED

It also endorsed the principle of a flexible tariff.

Senator Henry C. Dworshak, Representative of Idaho, declared "many of the conclusions reached by the Commission are illogical and highly discriminatory."

"Failure to develop our domestic sources on every hand would result in scarcity and price gouging in an emergency such as occurred with tin and rubber and other critical materials during the outset of World War II," he said.

"I cannot agree with the Commission, that we are a have-not Nation."

Horace M. Albright, president of the United States Potash Co., made a motion that carried, calling upon President Truman to accept a committee of mining men within the mining congress to work with the Paley Commission, keep the report alive and make possible constant revision to meet changing conditions.

Tuesday the congress was to take up consideration of manpower, labor relations and related problems. Senator Pat McCarran, Democrat of Nevada, veteran congressional spokesman for the mining industry, was to be a featured speaker at the congress.

[From American Metal Market, September 23, 1952]

No One Can Competently Estimate Metal Needs 25 Years Ahead, Andrew Fletcher Tells Convention of Mining Men at Denver

FINDS FAULT IN PALEY REPORT—HOWARD I. YOUNG REVIEWS WORK OF DEFENSE MATERIALS PROCUREMENT AGENCY BEFORE MINING CONGRESS

Denver, September 22.—The President's Materials Policy Commission report, often termed the Paley report, received considerable criticism at the convention of the American Mining Congress which opened here today. Among other highlights at the meetings was a review of the operations of the Defense Materials Procurement Agency by Howard I. Young, Deputy Administrator of the National Production Authority.

The St. Joseph Lead Co. is unable to agree with the forecast of the President's Material Policy Commission on lead, said Mr. Andrew Fletcher, president of the St. Joseph Lead Co. Whereas the Commission forecasts a lead consumption of 1,950,000 tons in 1975, Mr. Fletcher believes that no one can make a competent estimate that far ahead in view of the rapid changes in our economy, but he guesses that the lead consumption would probably be around 1,420,000 tons. He bases his conclusion upon the assumption that lead consumption per capita in 1975 will not be much more than the per capita consumption of lead during the past 20 years—about 15 pounds per person—and that population will be the 193 million anticipated by the Commission.

Mr. Fletcher stated that: "From 1925 to 1950 the population growth was about 36 percent, while lead consumption grew 33 percent. But, for the next 25 years the Commission assumes a lead growth of 61 percent, although they estimate a population growth of only 27 percent. Therefore, using past experience as a base, lead consumption would increase 25 percent, not 61 percent, over the next 25 years. With a present consumption of around 1 million tons, exclusive of stockpiling, the 1975 consumption would approximate only 1,250,000 tons. However, I assure you that we in the lead industry are constantly striving to increase our markets, so I think a consumption of around 1,420,000 tons is probably a more reasonable forecast."

Mr. Fletcher also disagreed with the Commission's forecast of domestic production of only 300,000 tons 25 years from now. His estimate is 375,000 tons. Moreover, he feels that foreign production, particularly in Africa, Canada, and Australia may actually increase.

LEAD SCRAP

He indicated that the Commission had not given adequate consideration to the recovery of lead from scrap, which has become tremendously important, accounting nowadays for about 500,000 tons of lead per year. He believes that we might well anticipate scrap recovery in 1975 of about 850,000 tons per year—about 100,000 tons higher than the Commission's forecast.

Mr. Fletcher stated: "A comparison of the Commission's 900,000 tons of lead deficit and St. Joe's 200,000 tons certainly indicates a wide difference of opinion, and raises doubt in my mind as to whether there may not also be similar great differences of opinion between the Commission and industry on other commodities." He indicated that "their 900,000-ton deficit may have frightened them into recommending the adoption of such alien control measures as multilateral Government contracts, buffer stocks, quotas, and so forth, which, if adopted, will result in the socialization of the domestic, as well as the world, mining industries."

MR. YOUNG DISCUSSES DMPA

Mr. Young summarized the individual DMPA programs as follows:

BERYLLIUM

The Government-industry program on beryllium calls for a 70-percent expansion in production by 1955 through purchase and resale contracts, loans, geological investigation, process development in the field of ore dressing, various hydrometallurgical studies, and related investigations. Studies looking toward beryl concentration on a commercial scale are proceeding apace.

COPPER

The copper program calls for an expansion of 25 percent by 1955. Production is being increased at existing plants; high-cost mines are being kept in operation through payment of overceiling prices; plants at some mines have been expanded; new properties are being brought into production and old properties are being reopened. The country's position with respect to copper should be greatly improved for years to come as a result of this Government-industry program.

FLUORSPAR

The fluorspar program calls for a 50 percent increase in production by 1955 through purchase and resale contracts, commitments-to-purchase contracts and tax-amortization certificates.

IRON ORE

Production of iron ore will be up approximately 40 percent by 1955, largely through the issuance of tax amortization certificates. The Government also is assisting in the building of access roads and in the procurement of machinery and materials.

MANGANESE

A 30 percent increase in the Nation's supply of manganese by 1955 is expected to result from fuller utilization of domestic ores that are readily amenable to concentration by conventional methods, the establishment of government purchase depots, purchase and resale contracts, and increased imports. Moreover, definite steps have been taken to perfect methods for the extraction of manganese from slag and to develop processes for obtaining manganese from low-grade domestic ores.

MICA

Foreign purchase contracts and the establishment of domestic buying stations are expected to increase the country's supplies of block and film mica by 50 percent in 1955.

MOLYBDENUM

An expansion of 130 percent in United States production of molybdenum by 1955 is assured through commitment-to-purchase contracts and tax-amortization certificates. A part of the expansion will come from a single large deposit of low-grade ores.

NICKEL

The supply of nickel will be increased by approximately 35 percent by 1955 through purchase contracts, loans, tax-amortization certificates, and reactivation of the Government-owned Nicaro plan in Cuba. Present plans call for still further expansion after 1955.

TUNGSTEN

The tungsten program calls for an expansion of 190 percent by 1955 through the Government's domestic purchase program and purchases from abroad.

ZINC

Purchase contracts and tax-amortization certificates are expected to result in a 15 percent increase in production of zinc by 1955. Several additional sources of supply are known and still further expansion would be possible.

Any review of developments in the field of metals and minerals during the past year would be incomplete without special mention of titanium. While there are many problems yet to be worked out in the fabrication as well as the production of this metal, it is generally conceded that its use in the manufacture of both military equipment and civilian goods is certain to expand very greatly during the next several years. The situation is changing so rapidly that I would hesitate to predict just what our supply of this remarkable metal will be at any given time in the future, but production already scheduled for 1955 is several times the present plant capacity. DMPA is assisting substantially in this expansion for defense purposes.

To date, DMPA has developed programs to expand the production of 17 different metals and 22 nonmetallic minerals. Four of the metals programs and 9 of the programs for nonmetals already have been completed—that is,

sufficient production is assured to meet all estimated requirements. In addition, 11 of the metals programs and 8 of the nonmetals programs are between 70 and 100 percent complete, leaving only 2 metals and 5 nonmetals still below 70 percent complete. Altogether, we are concerned with approximately 75 different materials.

DMPA has received some 1,882 applications for government assistance. Of this number, 430 have been withdrawn and 671 have been denied.

Other comments by Mr. Young follow:

We work always in a world of changing requirements, shifting prices, unsettled situations abroad and many other uncertainties. The decisions we have to make from day to day are seldom easy. Through our Industry Advisory Committee meetings and in many other ways we bring to bear on every question the best judgment that is available to us before we decide on a course of action.

Our decisions are not always popular with all segments of the press or all segments of industry, but on the whole I feel that the work we are doing has been well received.

Perhaps the sharpest criticism that has come our way during the past year was in connection with our announcement that we had been authorized to purchase 30,000 tons of lead during a period of easing demand and falling prices. Our purpose was not to take up the slack in the market but simply to be prepared to meet requirements later in the event the supply situation tightened up again. To date we have bought 26,105 tons. We are holding it for the time being for resale to industry, if the need arises. Any of the reserve that is not needed during the next few months will be turned over the the national stockpile. The lead program, incidentally, calls for an expansion of only 2 percent by 1955.

STOCKPILE

As you know, the Government regularly buys materials required for the national stockpile as they become available and are not needed by essential industries. Only last fall, lead was in such short supply that there was not enough available in the latter part of the year to maintain the production of high-test gasoline at required levels, and it was necessary to take lead out of the stockpile.

We didn't want that to happen again, so when the supply situation eased up earlier this year, it seemed the better part of wisdom to lay our hands on a limited amount of lead while the getting was good. The price was advantageous to the Government, and we knew that sooner or later we were going to need the lead. Instead of turning it over to the stockpile immediately, however, we felt that it should be held in reserve to meet any industrial needs that might develop during the remainder of the year.

I thought it was good business at the time, and I still think so. But for the benefit of anyone who may have the notion that this is going to be a regular activity of DMPA, let me say that there are no plans at present and that there have been no plans to set up temporary reserves of other materials.

And this brings me to a question that is asked of us more often, perhaps, than any other. On what basis do we approve or disapprove government assistance? It is a good question. But the answer to it is both simple and complex.

The simple answer is that we study each situation on its merits, decide upon a course of action that promises to get the best results at the least cost to all concerned and then go ahead.

But I don't need to remind you people in the metals and minerals business that this is easier said than done. As you well know, you seldom encounter two situations that are entirely alike. Copper is copper, but the production of copper presents particular problems that vary almost with every mining operation. What is sauce for the goose is not necessarily sauce for the gander in this business.

Remember, too, that DMPA, despite the very great authority that has been vested in it under the Defense Production Act is not entirely a free agent.

For example, all DMPA programs must be fitted into the operations of and have the concurrence of the Defense Production Administration, which sets the overall goals for strategic materials and which, of course, has its own policies, programs, and problems.

Our operations also have to be kept in mesh with those of the General Services Administration's Emergency Procurement Service, the agency which does the buying for the national stockpile. Both DMPA and EPS, of course, work very closely with the Munitions Board, which sets the specifications and require-

ments for the stockpile. And all of us take orders from the Bureau of the Budget.

Then there are all the special problems that have to be worked out in connection with our foreign expansion program. To date, the greatest emphasis has been on developing our domestic resources, but there has been some very important activity in the foreign field, too. The groundwork for our foreign development program was done by the Strategic Materials Division of the Economic Cooperation Administration, and after DMPA was set up it was our good fortune to have that division transferred to our organization.

No one who has a part in the management of an agency dealing with problems as critical and as varied as those of the Defense Materials Procurement Agency leads the simple life. I am happy to be able to say that we have an efficient and industrious staff, a great many of whom are intimately acquainted with the mining industry. I don't know anyone on the staff who has not been willing to lay personal interests aside when it was a question of working into the night to get a job done. And we open up bright and early in the morning, too, I can tell you.

Whether it is help in obtaining a tax-amortization certificate that a company needs in order to expand its production, whether it is a loan, a guaranteed purchase contract or some other form of assistance, DMPA is there to help. As you know, we have contracts with a number of large firms, but we also have assisted in boosting the production of the smaller operators wherever there has been an opportunity to get more materials for national defense that way.

[From the Journal of Commerce, September 23, 1952]

PALEY LEAD REPORT DISPUTED; HIT AS SOCIALIZATION BUILDUP

Special to Journal of Commerce

DENVER, September 22.—Recent predictions of a big lead shortage in 1975 as contained in the report of the President's Material Policy Commission were today attacked as misleading and as the basis for recommendations which could result in the socialization of the mining industry.

Andrew Fletcher, president of the St. Joseph Lead Co., today forecast that the deficit in lead supplies in 1975 would not amount to more than 200,000 tons, as against the Paley Commission's forecast of a 900,000 ton deficit.

PANEL DISCUSSES REPORT

Mr. Fletcher's counterforecast was delivered at a panel discussion of the Paley Commission's report held in conjunction with the annual meeting here of the American Mining Congress.

The St. Joe executive in issuing his estimate nevertheless contended that, "No one can foresee with any great competence what our economy will actually be in 1975."

FLETCHER DEFENDS FORECAST

"If we were to go back to the year 1927, just 25 years ago, who could have predicted the important new industrial developments of the United States, such as dieselization of our railroads, television, plastics, the formation of new textile products, or the conquest of international transportation through air?"

While questioning the competence of anyone to peer into the future of industrial developments with any certainty, Mr. Fletcher defended his forecast on the basis of his company's extensive knowledge of lead industry trends.

But Mr. Fletcher emphasized that he was more concerned with the implications of the Paley Commission's report than with which estimate was likely to be vindicated.

"Whether we or the Commission are even reasonably close to a correct deficit estimate, would be only of academic interest to prove that different figures and assumptions give an entirely changed picture—if it were not for the fact that the Commission's forecast is subject to severe criticism.

"Their 900,000 tons deficit estimate may have frightened them into recommending the adoption of such alien control measures as multilateral Government contracts, buffer stocks, quotas, etc., which, if adopted, will result in the socialization of the domestic as well as the world mining industries."

BASIS FOR ESTIMATE

This is how Mr. Fletcher arrived at a different estimate of the lead situation in 1975 than that issued by the Paley Commission:

"From 1925 to 1950, the population growth was about 36 percent while lead consumption grew 33 percent. But, for the next 25 years, the Paley Commission assumes a lead growth of 61 percent although they estimate a population growth of only 27 percent.

"Therefore, using past experience as a base, lead consumption would increase 25 percent, not 61 percent over the next 25 years."

Pointing out that present consumption is about 1 million tons, exclusive of stockpiling, Mr. Fletcher said that 1975 consumption would therefore be in the neighborhood of 1,250,000 tons, although market development might push this total to 1,420,000 tons. The Paley Commission estimated demand at 1,950,000 tons.

FINDS DATA UNDERESTIMATED

Mr. Fletcher also differed with the Paley Commission's estimates of production. He said the Commission had not given adequate consideration to the recovery of lead from scrap or to the rising output of the metal in foreign countries.

Mr. Fletcher added that a comparison of the Paley Commission estimate on lead supplies and that of his company indicates a wide difference of opinion "and raises doubt in my mind as to whether there may not also be similar great differences of opinion between the Commission and industry on other commodities."

An official of the Defense Materials Procurement Agency defended before the convention today the agency's plan for a "civilian" stockpile in lead.

PURPOSE OF PLAN

Howard I. Young, Deputy Administrator, said that the plan's purpose was not to take up the slack in the market but to prepare to meet requirements in the event the supply situation tightened up again. Thus far, he said, the Government has purchased 26,105 tons and is holding it for resale to industry if the need arises.

Mr. Young assured the industry that the DMPA was not going to make it a regular practice to build "civilian" stockpiles and that there are no plans at present to set up temporary reserves of other materials.

[From the Wall Street Journal, September 23, 1952]

METALS DISPUTE—MINING LEADERS RAP "PALEY REPORT" SCHEME OF BUFFER STOCK, WORLD CURBS

Special to the Wall Street Journal

DENVER.—Two of the country's major nonferrous mining enterprises yesterday emphatically disagreed with recommendations and forecasts of President Truman's Material Policy Commission—the so-called "Paley report."

This commission, headed by William S. Paley, chairman of Columbia Broadcasting System, recently issued its report forecasting by 1975 there would be tremendous increases in consumption of metals—lead, copper, and zinc among others—and dire shortages. It recommended world multilateral government contracts, buffer stocks, quotas, and a host of other ideas.

Andrew Fletcher, president of St. Joseph Lead Co., the country's largest individual mine producer of lead, took strong objection to the Commission's report that United States' lead consumption by 1975 would be 1,950,000 tons and domestic production from mines and scrap would be only 1,050,000—a deficit of 900,000 tons that would have to be made up by imports. The Commission figured on a United States mine output of 300,000 tons in 1975 and 750,000 recovered from scrap.

The St. Joseph president estimated that 1975 lead consumption would be about 1,420,000 tons, figured on a per capita consumption of 15 pounds and the 193 million population forecast by the Commission by that year.

SEES SMALLER DEFICIT

The mining official added that United States production of lead by 1975 would total about 1,225,000 tons—375,000 from domestic mines and 850,000 recovered from scrap. That would be a deficit of only 200,000 tons, compared with the Commission's estimate of 900,000—a difference of 700,000.

Mr. Fletcher made his remarks before a panel discussion of the Commission held yesterday at a gathering of the American Mining Congress, the industry's national organization.

He said: "A comparison of the Commission's 900,000-ton lead deficit and St. Joe's 200,000 tons certainly indicates a wide difference of opinion and raises doubt in my mind as to whether there may not also be similar great differences of opinion between the Commission and industry on other commodities." He indicated the 900,000-ton deficit may have frightened the Commission into recommending the adoption of worldwide governmental controls "which, if adopted, will result in socialization of the domestic, as well as the world mining industries."

Simon D. Strauss, vice president of American Smelting & Refining Co., attacked the Commission's recommendations that international buffer stocks should be created by the United States and other governments for stabilizing raw materials markets.

"A governmentally operated international buffer stock, if undertaken, would hand over the metal markets like a sword of Damocles. Decisions would be long-delayed in the making. While uncertainty over them existed neither producers nor consumers could plan to operate in a normal way, dreading the possible disastrous financial consequences of misjudging the buffer stock's programs," he said.

"We would wait in fear and trembling for the result of this monstrous mountain's labors, and when it did come forth I suspect it might well be a mouse," he added.

"WOULD BE INTOLERABLE"

Mr. Strauss declared the buffer stock proposal is advanced by the Commission on the theory it is difficult for private capital to operate in a market in which prices fluctuate widely. "It would be intolerable, however," he asserted, "for private capital to work in a climate in which the entire investment is in constant jeopardy because of potential political decisions of an organization responsible to no single group of stockholders.

"All efforts in the past at international controls over raw materials have been a failure when these efforts have been made by private cartels; the substitution of politicians for industrialists does not make the cartel theory any more palatable."

Among the problems of international buffer stocks, he added, is that of currency. The weak currency soon would drive out the strong, and the buffer stock may find itself with most of its working capital, after a time, in one foreign currency with most of its purchases to be made in another, Mr. Strauss declared.

Concerning the Commission's statement that the aggregate cost would not be so great as to overtax the resources of the participating countries, Mr. Strauss guessed the amount would be at least as great as the United States stockpile effort, now estimated at more than $9 billion. He commented that the resources of the participating countries are already overtaxed without any buffer stock schemes.

A more serious objection is the improbability that fifty-odd nations which will be involved in the management of the buffer stocks can be brought together to operate in an effective or prompt manner, he said.

Along this line, he cited the failure of the International Tin Committee after 6 years of interchanging ideas to reach any conclusive agreements.

Mr. Strauss also called attention to long-drawn-out deliberations of the United States Government concerning Bolivian tin, Chilean copper, and many other minerals. "When a decision is finally reached the situation frequently has altered radically and a policy that may originally have been sound is no longer applicable," he said.

[From American Metal Market, September 24, 1952]

SIMON D. STRAUSS SCORES PALEY REPORT SUGGESTION TO CREATE BUFFER STOCKS AS A METHOD TO STABILIZE MARKETS

DENVER, September 23.—The recommendations of the President's Materials Policy Commission report to create international buffer stocks to stabilize markets were scored here yesterday by Simon D. Strauss, vice president of American Smelting & Refining Co. Mr. Strauss discussed the tin buffer stock picture.

He concluded that it would be intolerable for private capital to function properly under the buffer plan which he referred to as a political cartel.

The text of Mr. Strauss' discussion at the American Mining Congress panel on the Paley report follows:

I shall confine my initial discussion to the Commission's recommendation that international buffer stocks should be created by our own and other governments for the purpose of stabilizing raw material markets. This is a proposal of such magnitude that it alone could properly be made the subject of our entire proceedings. I shall therefore be able in the allotted time to discuss only a few aspects of it.

The Commission believes that wide swings in raw materials prices discourage investment in new ventures and that consequently capacity tends to be inadequate to meet the peak levels of demand at times of international stress. In addition, it argues that stabilizing raw materials prices would assist the economy of the so-called underdeveloped countries, thereby reducing the hazard of political disturbances and perhaps preventing expropriation of foreign investments such as has occurred in the Near East and in Latin America.

This is tempting bait to our industry. Miners are apt to grow impatient with those of us in the commercial end of the business when they see prices of metals decline. I must admit that the complaints on their part about rising metal prices are rather rare. The prospect of being able to plan development and production from a mineral deposit with assurance that prices will not vary materially is bound to appeal to the miner.

TWO QUESTIONS

But before we leap to the bait, let us examine what is really entailed. Two questions immediately occur: (1) Is the plan really feasible? Can it be made to work as the Commission suggests? (2) Further, regardless of the answer to question one, is the plan compatible with the spirit of free enterprise?

Let us deal first with the feasibility of the scheme. The Commission's report suggests that these buffer stocks would be operated by an international group in which both producing and consuming countries would participate and to which both would contribute financial support. Each country's contribution might be determined, the Commission says, by its relative share in world exports and imports.

There is a problem of currency here. Would each country's contribution be in its own currency? When the buffer stock buys, would it pay for its purchases in the currency of the country from which it buys? When it sells, will it sell in the currency of the country to which it sells? If so, the weak currency will soon drive out the strong. The buffer stock may find itself with most of its working capital, after a time, in, let us say, lira and yet most of its purchases to be made in, let us say, dollars.

The Commission states that the aggregate cost would not be so great as to overtax the resources of participating countries, but gives no estimate of the actual amount required. My own guess is that the amount would have to be at least as great as that involved in the United States stockpile effort, a program now estimated at over $9 billion. Further, I would say that the resources of the participating countries are already overtaxed without any buffer schemes, in the sense that most governments are operating at staggering deficits and are levying record-breaking taxes. Another nine billion cannot be shrugged to one side as of no moment, but probably should not be the major consideration.

BUFFER STOCKS

A more serious objection is the improbability that the 50-odd nations that would be involved in the management of the buffer stocks could be brought together to operate in an effective or prompt manner. Let us look at the record of a few recent attempts at international economic cooperation.

An International Tin Committee on which all the leading tin producing and consuming countries are represented has been in existence since the end of World War II. The Committee has met at least once each year in such widely scattered places as Washington, Brussels, London, Paris, Rome, and Geneva. Statistics have been hashed over, proposals have been put forward for expanding production or limiting it, for increasing consumption or limiting it, for price stabilization or for price decontrol, and for international agreements to assure the stability of the tin market for years to come—protecting the interests of consumers and producers alike. The participants have included the usual range of real experts, of sincere and well-meaning Government people, of responsible representatives of industry, and of bumbling bureaucrats who have gone along for the ride and the free martinis.

What have been the actual accomplishments? None. After 6 years of interchanging ideas the producers and consumers of tin were so angry with each other that during 1951 the metals-trade press published almost daily official statements of vituperation in which the language was so intemperate I hesitate to reproduce it here.

The International Monetary Fund was formed at the end of World War II for the purpose of facilitating unimpeded multilateral trade and the general convertibility of currencies. Fifty-four nations are now members of the fund. Please note that currencies are produced by governments. This is a field in which private enterprise is prohibited (and if undertaken is subject to fines or imprisonment or both) and in which government has the undisputed power. Here surely international cooperation should be successful.

The currency equivalent of an international commodity buffer stock was set up for the Monetary Fund. The total of all individual quotas amounted to more than $8 billion. Yet in the first 7 years of operation only 10 percent of this total has been actually used. Despite the existence of the fund, its management reports that during the last 7 years the "balance of payment difficulties have been continuous or recurrent, and most countries have either been unable to make substantial progress toward freer international trade, or have had to reverse from time to time some of the steps taken in that direction." This is the fund's own description of what has occurred.

If an international group consisting solely of government representatives is unable to stablize the value of currencies—which governments alone can issue—is it likely that they can successfully stablize the value of commodities produced by private enterprise?

I do not wish to belittle the abilities or motives of the many devoted, honest, and sincere Government officials who have conscientiously struggled with the problems of minerals supply in the period since the end of World War II. The great majority have acted in good faith and with the motive only to accomplish the tasks to which they have been assigned.

However, government operation by its very nature is slow and cumbersome. Within our own Government, negotiations for Bolivian tin, Chilean copper, and many other minerals have been delayed time and time again not by deliberate procrastination but by the necessity of reconciling the divergent views of the Munitions Board, the Reconstruction Finance Corporation, the General Services Administration, the Office of Price Stabilization, the Defense Production Administration, the State Department and the Department of Interior. When a decision is finally reached the situation frequently has meanwhile been altered radically and a policy that may originally have been sound is no longer.

SLOW DECISIONS

If our own Government is so slow in coming to a decision, what then about an international group? The answer can be found in the futile record of the International Materials Conference, the accomplishments of which have been substantially nil. The need for referring decisions back to the home governments, the ability of a producer interest or a consumer interest to block action on a matter of direct concern, the tedious task of creating an agreed statistical base prior to any action at all, all of these have made the so-called allocations of International Materials Conference simply paper record of no significance.

The Commission describes the buffer stock as being based "on reasonable anticipations of the long-run price of the material under control * * * ceiling and floor prices would be based on the best estimates of future production and consumption * * * periodically modified in the light of actual market behavior and revised forecasts."

The prospectus makes it sound as if nothing but reason and light would govern the decisions of the buffer stock authorities. We know, of course, that that would not be so. Political considerations would be certain to influence the decisions. If the authorities concluded, for instance, that world aluminum production should be fostered at the expense of copper, then that is what would happen. The Defense Production Administration last year was for a time following a course that seemed intended to foster the one industry at the expense of the other. On an international scale similar favoritism would have results incalculably more damaging because with their power to set minimum and maximum prices and to withhold or market stocks running into the hundreds of thousands of tons the central authorities would have undisputed control of the market.

Furthermore, how good is governmental judgment likely to be as to the long-run prices of the materials under control? At best it will be no better than that of private industry— which is subject to wide error—and more likely it will not be as good. Let me cite an instance.

ADMIRATION FOR BRITISH CIVIL SERVICE

I yield to none in my admiration for the British civil service, which has a long tradition of integrity and devotion to the public good. Yet look at the record of the British Government in the last 2 years in its bulk buying of materials.

Convinced that shortages of lead and zinc would prove long lived, the British last year bought large quantities of both metals for delivery extending into this year at prices of 21½ cents and 23½ cents a pound, respectively. Had it not been for this British buying during 1951 the prices of lead and zinc outside the United States would not have gone as high as they did and the shortages would not have been as pronounced.

But by the end of the first quarter of 1952, the physical stocks of lead in the United Kingdom were so great that the British Government resold a huge tonnage of lead to the United States stockpile at losses ranging upward from $50 a ton. As for zinc, with the present market price 14½ cents a pound the British are still taking delivery of large tonnages at prices in excess of 20 cents a pound and their stocks are climbing by several thousand tons a month.

I have not singled out the British Government because I believe it to be more prone to error than others; on the contrary any group undertaking the same job might well have made the same mistakes.

My point simply is that when a government or a group of governments errs the effect on the market is infinitely more serious than when a private buyer or seller does so. The British buying in 1951 and selling in 1952, far from helping to stabilize metal markets, actually has tended to increase instability.

PRIVATE CONSUMER

The private consumer might make the same mistakes. I can testify from direct experience that frequently the private seller misjudges the market trend. But a private consumer or a private producer can push his error only so far, then the inexorable factor of financial prudence makes him correct his position. No British private consumer, for insance, could have bought 50,000 or 75,000 tons too much lead in 1951—he could not have had the means. A governmental buying agency—and this is doubly true of an intergovernmental agency—has almost unlimited resources at its disposal. It simply taps the public till for additional funds to perpetuate its mistakes.

Private investors are all too aware of the unpredictable turns which governmental decisions may take. Regardless of the assurances that may be contained in any agreement establishing an international buffer stock, investors would be bound to look with a jaundiced eye at the existence of huge inventories of metals in the hands of a group of governmental officials subject to political pressures.

I conclude, therefore, that a governmentally operated international buffer stock—if undertaken—would hang over the metal markets like a sword of Damocles. Decisions would be long delayed in the making and while uncertainty over them existed neither producers nor consumers could plan or operate in a normal way, dreading the possible disastrous financial consequences of misjudging the buffer stock's programs. We would wait in fear and trembling for the result of this monstrous mountain's labors and when it did come forth I suspect it might well be a mouse.

The buffer stock proposal is advanced by the Commission on the theory that it is difficult for private capital to operate in a market in which prices fluctuate

widely; it would be intolerable, however, for private capital to work in a climate in which the entire investment is in constant jeopardy because of potential political decisions of an organization responsible to no single nation or to no single group of stockholders.

All efforts in the past at international controls over raw materials have been a failure when these efforts have been made by private cartels; the substitution of politicians for industrialists does not make the cartel theory any more palatable.

[From Bulletin Service, the American Mining Congress, September 29, 1952]

MATERIALS SUPPLY

William S. Paley, chairman, Columbia Broadcasting System, and former chairman of the President's Materials Policy Commission, in a recent address called upon American industry to intiate action to overcome materials shortages. Paley said that industry should initiate a continuous study: (1) to get more materials and more energy from domestic sources at low cost; (2) to make better use of what is obtained and to find ways to use new and more abundant materials as substitutes for scarce domestic materials; and (3) to import more materials from other nations on terms that are advantageous to both this country and to them.

Paley also said that interindustry groups need to make for themselves the kind of study that the President's Materials Policy Commission attempted for the entire nation.

He reiterated the Paley report's conclusions as to reductions in tariff and for elimination of the Buy American Act, and said these proposals should be made effective in order to increase our materials supply.

Meanwhile the metal and nonmetallic mineral mining convention of the American Mining Congress, in Denver, adopted a resolution which commended the President's Materials Policy Commission for (1) urging acceleration of topographic and geologic mapping of the United States and Alaska; (2) recognizing and approving the principle of percentage depletion for minerals and metals; (3) advocating removal of the present limitation on the expensing of exploration costs applicable to minerals; (4) appreciating the necessity of encouraging participation of American capital in the development of foreign mineral resources; and (5) advocating the encouragement of small mining enterprises. However, the Convention opposed the Paley report's proposals as to international buffer stocks, and found itself forced to disagree with many of the Commission's recommendations, conclusions and beliefs. The industry's resolution stated:

(*a*) Direct exploration activities by Government should not be undertaken on private lands.

(*b*) The mining laws should not be revised to introduce a leasing system for mental miners or abolish extralateral rights.

(*c*) American taxpayers' funds should not be used to explore private lands in foreign countries.

(*d*) A Defense Materials Procurement Agency should not be established as a permanent instrumentality of the Government.

(*e*) Successor Government agencies should not be established when the present emergency agencies are dissolved.

(*f*) Business risks which the Export-Import Bank is unwilling to assume should not be transferred to the American taxpayer.

(*g*) Legislation should not be enacted to furnish Government loans for foreign mineral enterprises, coupled with authorization for Government to enter into management contracts.

(*h*) Permanent legislation should not be enacted authorizing the unilateral elimination of import duties by the executive branch wherever the United States is substantially dependent on imports of mentals or minerals.

(*i*) The Buy American Act of 1933 should not be repealed.

[From the Wall Street Journal, October 9, 1952]

THE INEXHAUSTIBLE RESERVE

In 1920 the reserves of iron ore in the Mesabi Range in the upper Great Lakes region were estimated by the experts at 1.3 billion tons. In the 31 years between then and 1951 some 1.2 billion tons were dug out of the ground and poured into the Nation's steel mills.

A little simple arithmetic would thus seem to indicate that the Great Mesabi must now be exhausted, with barely a hundred million tons of ore left. And since the Mesabi Range has long been considered one of our greatest national resources, we—by the experts' logical calculations—ought to be in very bad shape indeed.

There is only one trouble with all these calculations. They were wrong. Having taken out over a billion tons of ore, once again the experts figure that there are almost a billion tons of reserves left.

So now, starting with something less than a billion tons of reserves and taking the consumption figure of the past, we can logically deduce that in the next 31 years the Mesabi will be exhausted—once more. And thus we could, were we a Government planner, make a plausible argument for Government control over the uses of the Mesabi to save our resources.

This, in effect, is what a host of Government commissions have been arguing for years. Within our own memory we have seen horrendous reports that our oil reserves or our coal reserves or our timber reserves or whatever stand upon the brink of extinction. Always, of course, unless the Government steps in to curb production by some "predatory" interests. But the Government didn't and somehow the dire predictions have failed to come true.

These warnings were not illogical. They would have been as hard to refute with logic as Malthus' that the world could not feed anywhere near 2 billion persons, which it now does. What made them wrong was not a failure in logical reasoning from known facts but that they did not—indeed, could not—take into account the unknown.

And that unknown is not merely the turning up of unexpected reserves but the inestimable expanse of human ingenuity.

Somewhat before our memory there was a report of a whaling commission which figured out quite logically that the world would soon be bereft of whale oil and therefore in a dire fix. The unknown there was not a sudden discovery of new whales but human ingenuity which built the petroleum industry. In the case of the iron ore there was a combination of the discovery of new physical resources and great technical improvements in utilizing lower and lower grade ores.

We are not trying to suggest in all this that we ignore such reports. Stock-taking is a prudent thing, if for no other reason than that it is a spur to ingenuity. We are suggesting that it is dangerous to take inventory and then to act on the premise that this inventory is absolute, that all progress has come to an end. We must not paralyze ourselves with the idea that all we can do is ration out what is now on hand.

This, in substance, is what the current Paley Commission, like its predecessors, proposes. We are exhausting our natural resources; ergo, the Government must move in with a vast control program to save us from ourselves. We must put our fate in the hands of the expert planners who will plan the use of our resources on the basis of the experts' knowledge of the facts.

Yet what would have happened had we imprisoned our whole economy in a straightjacket plan based on the logical conclusions of the whaling commission or the experts' facts on the oil industry in 1900 or the Mesabi Range in 1920?

Unlike the Paley Commission, we do not pretend to see the future. Maybe the future will bring unexpected reserves of iron ore. Maybe it will bring ingenious methods of using low-grade taconite, which is plentiful. Maybe it will be new substances to make steel, one with whale oil. Maybe atomic energy will change the whole face of our peacetime living as it has done our warfare.

But the one lesson of the past is that whatever the limits of the Mesabi the resources of the future are limitless. Human ingenuity has been immobilized with shackles but it has never yet been exhausted.

[From Mining Engineering Reporter, October 1952]

The importance, validity, and acceptability of the Paley report has become the great issue of the minerals industry. A 12-man panel made up of representatives of various facets of the industry sat down at the 1952 Mining Congress Show in Denver in an attempt to clarify the many opinions currently held concerning the report.

Howard Young, deputy administrator of the Defense Materials Procurement Administration, noted that the report had caused more discussion and serious thinking than any other Government report. He did not subscribe to the "have not" principle, however, but called it a "need more" principle.

Horace M. Allbright, president of United States Potash Corp., believes industry should continue to develop the report. He cited the editorial appearing in the September 1952 edition of Mining Engineering, "Don't Let It Die," as expressing his feelings.

Edward Snyder, president of Combined Metals Reduction Corp., says the statistics used in the report were used to promote a false international policy. He sees the report as a master plan for the development of the super-state. He also stated that the ore reserves given in the Paley report represent only 10 percent of what is actually available.

Arthur H. Bunker, president of Climax Molybdenum Co., and a member of the Paley Commission, believes that self-sufficiency has never existed. Bunker feels that the national objective should be to obtain the most readily available material at the lowest possible cost.

Senator Henry W. Dworshak, of Idaho, offered the closing of the antimony mine at Stibnite, Idaho, as an example of using foreign sources in place of domestic supply. He does not feel the United States should stimulate foreign production.

Donald McLaughlin, president of Homestake Mining Co., terms the report timely and valuable, but that the trends outlined by the report are not necessarily conclusive. He sees a continuing growth of dependence on foreign sources, however.

Andrew Fletcher, president of St. Joseph Lead Co., forecast the deficits in lead production would not amount to more than 200,000 tons by 1975, as against the 900,000-ton prediction of the Paley Commission. He added, however, that no one can foresee our economy in 1975.

Simon D. Strauss, vice president of American Smelting & Refining Co., said "a Government-operated international buffer stock * * * would hang over the metals markets like a sword of Damocles. It would be intolerable for private capital to work in a climate in which the entire investment is in constant jeopardy because of potential political decisions of an organization responsible to no single nation."

OUTSIDE COMMENTS

Paley Commission–Excerpts From the Whaley-Eaton Letters

AMERICAN LETTERS

"A price-support program for the world raw materials is possible. The mechanism for this already exists in the stockpile, the Defense Materials Procurement Agency and the International Materials Conference. In the future, politics may substitute for strategic necessity as a reason for raising stockpile goals. The number of long-term floor and premium-price contracts let by DMPA is increasing. IMC would contribute distribution control.

"With a return to something more closely approaching a peaceful world, the need to protect overexpanded production facilities, at least during conversion, might become critical. National devices for economic control are more and more being applied to international problems" (No. 1751, March 22, 1952).

"Creation of a civilian stockpile of strategic raw materials is a long-term idea, with no serious immediate prospects. Congress would have to authorize the scheme and appropriate funds, neither of which will be done at this session. Also, the military stockpile is less than one-half complete. It would have first call on any materials supplies not required for current production, civilian or defense. As a matter of policy, a danger inherent in a civilian stockpile would always be that it could be manipulated by Government to serve an administration's economic or political ends.

"Increased a third-quarter allotments for civilian production, except as to aluminum, are based on a gamble: That manufacturers will not want all the metal for which they are given "tickets." Overallotment of copper, for example, will be 16 percent in the third quarter, compared to 6.5 percent in the second. Steel is to be overalloted by 13 percent, copper 17 percent. Estimated supplies of both steel and copper are somewhat smaller than those expected in the second quarter. Defense requirements of raw materials will be only slightly reduced.

"The military and atomic-energy program is to be allocated 10 percent of all steel, 17 percent of the copper, and 29 percent of the aluminum, for third-quarter use. This is the direct allotment, excluding components and plant.

"The first attempt to apply uniform policies for conservation and substitution of critically short materials in all the free nations is being undertaken by the International Materials Conference. Twenty special measures for conserving use of tungsten, molybdenum, manganese, nickel, and cobalt are included in the first proposal circulated among the participating nations.

"The recommendations mostly relate to qualitative steps to conserve supplies. The IMC committees suggested that even larger savings could be achieved through quantitative measures—meaning production controls—but that this was considered beyond their scope" (No. 1752, March 29, 1952).

"Branch offices of the Defense Materials Procurement Agency are being opened up around the world. The latest has been set up in London to cover Europe and part of Africa. This follows one in Mexico for Central America and part of the Caribbean. As incentives to foreign interests to increase raw-materials production these offices can grant direct loans through the Export-Import Bank, guarantee loans, place floor-price contracts, conclude spot over-market purchases, make advances on future production, finance exploration.

"They cannot grant subsidy contracts, tax-amortization certificates (except to United States companies operating abroad) or set up 'open-depot' purchasing centers. Contracts with foreign producers can be negotiated abroad, but must be approved and signed in Washington" (No. 1756, April 28, 1952).

"A complete review is being made of the stockpile requirements. Some targets will be increased, some lowered; some items will be added, others dropped from the list. A temptation will be to hike targets as a means of propping lagging world markets. On the outcome may rest future Government action as to further expansion, say, in aluminum, tungsten, copper, etc." (No. 1763, June 14, 1952).

"The 25-year forecasts of the special President's Materials Resources Commission will almost certainly fall wide of their mark. The group's task, however, was not so much that of predicting as of arriving at an objective view of potential American raw-material needs. The 100-man staff sought to maintain its objectivity. The net result is a picture of growing American dependence on foreign materials. Congress dislikes the implication that this necessitates an all-our Government policy of fostering expansion abroad.

"The shortcomings of the five-volume report are obvious. Imaginative thinking had to be ruled out, which precluded any assessment of the industrial future of atomic energy. The conclusions also underlay the potentialities of technological gains, especially in agriculture" (No. 1765, June 28, 1952).

"The price-supply situation in some metals is phony. Lead is an example. It is selling far below ceiling. The drop was recent and sudden. But no big new production has come in the consumption has not fallen. Consumers here and abroad had built excessive inventories. Some of these have been 'dumped.' Others are being consumed faster than they are replenished.

"Government's decision to stockpile lead—30,000 tons have been ordered—has two purposes: (*a*) to provide a hedge against possible future shortages and (*b*) to help stabilize the market now. It is uneconomic for some producers to operate at present prices.

"The stockpile more and more is looming as a major device for stabilizing world materials markets. Officials deny that there is any such intention. That may be true, but the net effect of Government buying practices is to do just that. Price of lead is down, so the stockpile steps in to buy—more for its money—and thus establishes an upward pressure on depressed prices.

"The United States Government in many cases is the world' largest single buyer of industrial materials. Whether or not it enters into stockpiling procurement often makes the marginal difference between surplus, balance or shortages. It will be in the market for many years to come" (No. 1766, July 5, 1952).

"Whether the United States is a 'have-not' or just a 'need-more' Nation has been under debate in Washington ever since the five-volume report of the President's Materials Policy Commission (Paley Report) was publisher in June. The argument will get its first public airing next week, in Denver, at the annual meeting of the American Mining Congress.

"The Paley Report (a White House document) wants current domestic programs extended to include the whole free world. The Defense Materials Procurement Agency and industry do not, in general, agree. They insist that the United States can do a better job of supplying its own needs, using such natural incentives as lower taxes, etc." (No. 1777, Sept. 20, 1952).

"The Government's program of raw-materials preparedness is two pronged. There is the stockpile—stocks on hand above ground ssufficient to tide the United States through 5 years of all-out war production. There is also the effort to

increase current production to a point where it alone can 'finance' full-scale armament. Are both needed? The effect of cerating production that cannot be readily consumed is extreme and widespread.

"This basic question has been brought into full public view by publication of the Report of the President's Materials Policy Commission (Paley Report). It has created a considerable stir and got a thorough airing at the recent Denver meeting of the American Mining Congress. The White House has asked for full industry comments. It is a problem that must be settled by the new administration.

"Commercial prices, Government expenses, and taxes are at stake in the final answer. Maintenance of abnormally high prices requires subsidies, both domestic and international. Many important economies (sterling) rise or fall on materials costs. Industry suffers from rigged markets and sharply fluctuating prices. Resources are lost through excesses" (No. 1779, Oct. 4, 1952).

29. Federal land management policies will be overhauled to allow more liberal utilization of Government lands by private enterprise. McKay wants no rigid Federal monopoly. Reasonable profits are foreseen for farmer, lumberman, miner, and oilman. Land improvements will be required, however.

30. "Greedy" exploitation will be banned. "The Government should guarantee fair treatment to private capital—which is all it expects."

31. Private petroleum development on Federal lands in Alaska has not raised the criticism expected. Interior Secretary McKay is pleased. The Phillips Petroleum Co.'s 10-year contract with Interior calls for oil exploration on nearly a million acres. Phillips must spend $1.2 million by 1956 and thereafter 40 cents an acre annually for development work or lose the contract. If oil is found, the Government, Alaska, and Phillips will share the benefits.

32. Lumber is next. Interior controls 46-million acres of commercial forests with 260 billion board feet of sawtimber. Last year it sold only 1.3 million feet for $18.5 million. More access roads, plus more liberal land management policies, could raise this to 4 billion feet annually—10 percent of consumption.

Paley Commission—Excerpts From the Whaley-Eaton Letters

FOREIGN LETTERS

"Stockpilers are investigating the possibilities of increasing procurement to 'normal' levels. Deliveries of copper, lead, zinc, and aluminum were all but halted last year to channel supplies to industry. Copper will be the last to attain normalcy. Rubber stocks are in excellent shape and only the best grades will be bought. Overall, targets remain about the same as a year ago.

"There will be no repetition of the 'any amount at any price' buying that occurred following Korea. Few purchases will be made at over United States ceiling prices. Long-term, floor-price contracts will increase.

"Strategic materials continue to be shipped behind the Iron Curtain, despite restrictions. Smuggling will always be a problem, but some items are moving through 'legitimate' channels. Britain maintains physical control over materials transshipped through her ports, but has no direct restrictions on transactions of her nationals abroad. Netherlands and Belgium do just the opposite. The result is that British-controlled cargoes move easily through Belgian and Dutch 'free' ports for ultimate shipment to prohibited countries" (No. 1714, Feb. 19, 1952).

"Top European economists list five basic obstacles to financial stability and recommend direct measures to overcome them. Their conclusions are presented in the report of the Economic Ministers of the Organization for European Economic Cooperation, under the chairmanship of Britain's Sir Arthur Salter. Britain's own representative was Lionel Robbins, noted economics professor and critic of government policy. OEEC will act formally on the report this fall.

"The five obstacles are: (*a*) the practice of uncoordinated strategic stockpiling, (*b*) the fragility of the structure of international short-term debt, (*c*) overvaluation of certain European currencies, (*d*) obstacles to international trade, notably new quantitative restrictions on imports and subsidies to exports, and (*e*) inadequate currency reserves of some OEEC member countries.

"To correct these faults, the report recommends resort to such orthodox measures as tighter short-term credit, reduced capital investments, stricter budget control, and resistance to increases in wages which are not matched by gains in production" (No. 1737, July 29, 1952).

"The developing anxiety over the condition of the world economy was reported in our American letter of August 2. The United States, when undertaking

industrial mobilization as a result of the Korean incident, almost riotously began stockpiling. There was no control of prices paid for strategic materials. Rubber and other commodities jumped to fantastic heights. This was justified on the ground that the purchases supplied Britain and others with dollars. Such funds were in addition to any direct aid. The economic drain on the United States became too heavy, and, as stockpiling became sufficient, prices for the commodities in question were permitted to drop sharply. They are not likely again to rise spectacularly. Accordingly, a major economic problem exists.

"It is hardly surprising, in view of the foregoing, that London talks of an economic conference of the free world. But just what it could accomplish quickly is not apparent. Irrespective of who is elected President, Congress has shown an intent to decrease rather than increase American financial aid abroad, direct or indirect" (No. 1738, Aug. 5, 1952).

"Elaborate preparations are already being made for the Commonwealth Economic Conference which will open in London on November 26, after the American elections. Ways will be sought to stabilize world commodity prices, particularly those of rubber, tin, wool, and cotton on which the sterling area depends so heavily for its hard-currency earnings. 'Stabilization' in this case would mean keeping the price both constant and 'fairly' high. The recent trend has been for prices of goods Britain sells to drop while those of materials she buys have (in general) remained stable or edged upward.

"Britain is unlikely to go along with any proposal to tear up the General Agreement on Tariffs and Trade (GATT) or cook up some special deal at the expense of the United States, no matter what is done at the GATT conference at Geneva, in October. More probably, the Commonwealth Conference will propose a far-reaching deal with the United States, such as a long-term purchasing agreement covering certain key raw materials produced within the sterling area.

"The United States already is progressively moving into the field of international subsidies. Federal procurement of industrial raw materials, rather than protective tariffs, is now the instrument for holding prices up, and preventing high-cost domestic mines from closing down. Lead, earlier this year, was bought by General Services for a civilian stockpile. The military stockpile has now resumed zinc procurement, not so much because zinc reserves on hand are insufficient as because of fear of lost production in the future.

"The net effect of these policies is to underwrite world prices. Offers to buy are made on the international markets, not just at home. The Truman administration believes the United States, as the world's largest single buyer, has certain responsibilities to stabilize the markets" (No. 1740, August 19, 1952).

"British insistence on a top-level NATO meeting late in October is puzzling. The British proposal may be due to a belief that the regular annual review, due to be completed by mid-December, cannot take into account problems which can be solved only by the new United States administration. An October meeting could focus attention on these problems, notably offshore purchases and long-term commodity contracts" (No. 1742, September 2, 1952).

[From the Wall Street Journal, June 24, 1952]

LONG-RANGE PLANNING—TRUMAN GROUP URGES WORLD PACTS ON DISTRIBUTION, OUTPUT OF RAW MATERIALS IN PREDICTING NEEDS FOR 1975

By Henry Simmons, Staff Reporter of The Wall Street Journal

WASHINGTON.—Be on the watch for a new, long-range Government controls program, intended to increase this country's supplies of imported raw materials.

The groundwork for such a scheme has been laid in a ponderous five-volume report just issued by the Materials Policy Commission. President Truman set up the group more than a year ago to report on where the United States could get its future raw material requirements. The Commission has just come up with an ambitious answer: A bulky study on "Resources for Freedom."

This report attempts to forecast, for many years ahead, the Nation's economic growth. It also tries to assess the raw materials outlook for this country and the rest of the free world, and to suggest ways for "stabilizing" supplies and prices of commodities on a global scale.

The recommendations, should they be adopted in whole or in part, would call for such devices as world "agreements" on production and distribution of almost

every type of raw material, and international stockpiles which could be used to manipulate world prices of commodities.

COMMISSION MEMBERS LISTED

William S. Paley, chairman of Columbia Broadcasting System, headed the Commission which prepared the bulky report. Other members were George Rufus Brown, chairman of Texas Eastern Transmission Corp.; Arthur H. Bunker, president of Climax Molybdenum Co.; Eric Hodgins, an editor of Fortune Magazine, and Edward S. Mason, professor of economics at Harvard University.

The Commission's recommendations are perhaps more interesting and significant for their forecasts of the American economy of 1975 than for what is likely to be done by the Government to aid the flow of raw materials to industry. Congress would have to approve participation in any brandnew system of international price and allocation controls.

It is quite possible, however, that some of the Commission proposals—there are 70 specific recommendations in all—will show up in the foreign policy section of the Democratic platform in Chicago next month. If the Democrats win in November, the scheme likely would figure in the President's State of the Union message to Congress next January.

PICTURE OF 23 YEARS HENCE

The report emphasized that the Commission's forecasts can't be taken as "hard and fast" predictions. Nevertheless, the study creeps onto a limb with these forecasts of what the United States will look like 23 years from now, in 1975:

It will have a population of 193 million and a labor force of 82 million. It will have 62,500,000 homes, compared with 43 million in 1950. There will be 65 million cars on the road, compared with 49 million in 1950. Annual output of automobiles will be 15 percent greater than in the boom-year 1950, while output of refrigerators, air conditioners, and other consumer hard goods will climb 50 percent. Outlays for all construction will be 30 percent greater than in 1950.

The Commission was equally bullish in its estimates of the materials needed to reach these predicted levels:

Steel: The steel industry will pour 147 million tons of ingots and make 110 million tons of steel products in 1975. This compares with 1950 consumption of 97 million tons of ingots and 68 million tons of steel products.

Aluminum: Consumption will amount to 4,500,000 tons, compared with 980,000 in 1950, an increase of 358 percent.

Copper: A total of 1975 consumption of 2,500,000 tons, compared with 1,700,000 in 1950, an increase of 45 percent.

Petroleum: Annual consumption of 5 billion barrels in 1975, an increase of 110 percent from the 2.3 billion used in 1950.

Coal: Consumption of 815 million tons, compared with 522 million in 1950—up 56 percent.

Natural gas: Use of 15 trillion cubic feet in 1975, compared with 6.3 trillion in 1950, a boost of 138 percent.

Electricity: Use of 1.4 trillion kilowatt-hours in 1975, compared with 389 billion in 1950, a surge of 260 percent.

USE OF OTHER MATERIALS

Consumption of still other materials will rise by the following percentages compared with 1950: Lead, 61 percent; zinc, 38 percent; tin, 27 percent; antimony, 76 percent; iron ore, 54 percent; nickel 100 percent; molybedenum, 170 percent; cobalt, 340 percent; tungsten, 150 percent; fluorspar, 187 percent; rubber, 104 percent; and sulfur, 110 percent.

The Paley Commission insisted its forecast aren't intended as firm predictions of future United States needs, but rather as "indicators of the size of the problems the United States is likely to face." The group made its estimates on 2 basic assumptions—that the Nation's working force will be 82 million in 1975 and that man-hours' "productivity" will rise by 2½ percent a year between now and 1975.

On the basis of these assumptions, it estimated the Nation's gross national product at double the $278 million of goods and services turned out in 1950.

Two major weak spots show up in the Commission's forecasting techniques:

All the predictions involve the assumption that 1975 materials prices will maintain just about the same relationship they held in 1950. Any substantial departure from the old relationship, however, could completely distort the pattern of requirements mapped out by the Commission.

More important, radical technological advances could completely upset the forecasts. To get some idea of the kind of job the group is trying to perform, imagine the difficulty a similar set of forecasters would have faced in trying to forecast 1950 materials demands. They would have failed to foresee the television set, the vacuum cleaner, and the home air conditioner. They would have had no inkling of atomic power. They would probably draw a black on synthetic textiles. By 1950, their estimates would probably have borne no resemblance whatever to the actual state of the Nation's economy.

WEAK SPOTS IN FORECAST

The Commission—despite its avowed belief in a "minimum of interference" with private enterprise—clearly feels that United States' imports in a "free" world market just won't reach the necessary levels.

One of the great drawbacks of free world markets, according to the Commission, is the tendency of commodity producers to restrict output in order to maintain high, stable prices and thus avoid sharp fluctuations in world market prices. The group recommends two broad controls devices aimed at ironing out world price fluctuations and boosting materials output.

One involves international pacts called "multilateral contracts."

These agreements, says the Commission, would guarantee countries importing materials "a fixed minimum supply at specified maximum prices." At the same time, exporting nations would be guaranteed sales of materials at certain minimum prices. Such agreements would restrict commodity price ranges and assure healthy supplies for the United States and other importing nations, the Commission maintains.

The group comes up with a second device intended to do about the same thing. It calls for creation of international stockpiles of materials, or "buffer stocks," which would be used, possibly with export quota restrictions, to manipulate world prices of goods like copper, tin, lead, zinc, and natural rubber. When commodity prices sag, the stockpiles would buy raw materials in order to keep production high and to bolster prices. They'd sell materials when world prices climb.

URGES CONTINUATION OF DMPA

The Paley group also urged that the Defense Materials Procurement Agency be continued after the present emergency, with authority to make long-term purchase contracts for foreign-produced materials. The DMPA's successor should be able to finance foreign materials production by means of long-term loans, the Commission said.

In addition, the Commission wants a reduction in tariff barriers, repeal of so-called "buy-American" legislation, more favorable tax treatment for United States companies with foreign investments and increased technical assistance to underdeveloped countries. Finally, it recommends that the United States businessmen practice "economic statesmanship"—diplomatic treatment of foreign interests by American industrialists.

Though these schemes fit neatly into the administration's global aid ideas, many of them would require congressional approval. Whether Congress will be in the mood, sometime between now and 1975, to approve them is unforeseeable. But it isn't in such a mood at the moment. Just last week the House kicked the stuffing out of the Defense Production Act, particularly those portions permitting the United States to enter into international materials allocation agreements with foreign nations.

The Commission is a bit less controversial in its proposals for maintaining high domestic production of raw materials. With only one or two exceptions, they involve more intensified Government aid to raw materials producers, rather than any brand new schemes.

AID RAW MATERIAL SEARCH

For instance, to help industry search out new sources of raw materials here, the Commission recommends Government financial aid to small prospectors (which the Atomic Energy Commission already does in the case of uranium) more rapid

Federal mapping of minerals areas, research into new exploration techniques, more favorable tax treatment of exploration expenses of mining companies, "renovation" of State mining laws and rapid development of offshore oil reserves and power projects on the St. Lawrence, Niagara, and Columbia hydroelectric sites.

To improve technique in using available materials, the Commission urges larger appropriations for research by the National Science Foundation, increased Government research on home construction, Government research in coal technology and synthetic fuels, and possibly a Government subsidy to speed development of gasoline and oil from shale, the only direct subsidy recommended by the report.

In making its forecasts of the raw materials outlook for the future, the Commission attempts to make allowances for technological advances which might result in new sources of supply or have the effect of stretching known supplies of materials and fuels much further. In the case of petroleum, for example, the Commission suggests that synthetic liquid fuels eventually may be produced in large quantities from oil-bearing shale and, possibly coal. It has tried to reflect these possibilities in its forecasts.

The big difficulty, of course, is the possibility that radically new products and processes—not taken into account by the commissioners—may be introduced between now and 1975, with the result that the picture of the future painted by the group may have no resemblance to what actually takes place.

For example, the production of atomic power for cheap generation of electricity conceivably could result in the reappearance of an electric car. This would have the effect of reducing the Nation's total petroleum requirements far below the level predicted by the group.

[From the Wall Street Journal, June 25, 1952]

REVIEW AND OUTLOOK

THE PLANNERS AGAIN

A group of citizens composing the President's Materials Policy Commission foresees difficulties about the supply of raw materials; it says that developing shortages and mounting costs raise grave questions for the Nation's security and living standards.

One may be permitted to wonder how many times people have made such reports. Certainly they could be numbered in the thousands. And none of them have ever come true; all of them have been wrong.

The simple fact is that there is no case where a raw material has been depleted while men still found it useful. The one possible exception is the fertility of the land which can be exhausted. But even that can be restored.

There are many people alive and active who can remember dire predictions that the coal supply would be exhausted. The actual fact is that there is available more coal than people can use and the only shortage results not from a depleted supply but from planned economics which have so snarled matters that sufficient coal is not mined.

If someone had forecast for your great grandfather the present population of the United States, he would have taken pencil and paper and figured that there were not enough trees for the lumber to build houses to shelter so many people. But the people are here and lumber still is produced in quantities that would seem unbelievable to the revered ancestors.

About 25 years ago the elder Senator LaFollette was chairman of a Senate committee which warned that oil supplies were running out and that gasoline would go to $1 a gallon. There is plenty of oil, although the use of it has been many times what Senator LaFollette could foresee. And gasoline has never been as expensive as on the day of the LaFollette report—not even with the addition of numerous taxes.

But here we are again with a group of thoughtful gentlemen who intimate—although they had the wisdom to put in some "ifs" and "buts"—a shortage of raw materials. A quite conservative newspaper headlines the story "A Crisis in Raw Materials Found Imperiling Security?"

And how are we to avoid this danger?

Well, bless you, there must be some long-range planning. The Government would have considerable hand in controlling raw materials. And this Government would cooperate with other governments. There would be world agree-

ment on production and prices and there would be international stockpiles and pools.

If there is one thing that could bring the dire predictions to actuality it is Government control.

Let a government begin to allocate something and there immediately develops a shortage where none existed before. Let a government replace a free market and people begin to go without. Man has discovered no device so potent to stop production and disarrange distribution as the device of government control and interference.

If the Government of the United States—along with other governments—will attend to the matter of keeping peace, law and order, and if it will get its fat, stupid self out of trying to govern economic matters, the people left to themselves will find ways to accommodate themselves to changes just as they always have when and where governments have left them free to do so.

[From the New York Times, June 26, 1952]

TECHNICAL GAINS PREDICTED FOR ALL

ENGINEER TELLS DESIGN MEETING WORLD SHOULD BE ENTIRELY INDUSTRIALIZED BY YEAR 2000

(By Walter Dorwin Teague—Special to The New York Times)

ASPEN, Colo., June 25.—In the opening address yesterday of the Aspen Conference, Buckminister Fuller, well-known engineer, predicted that the entire world would be industrialized by the year 2000 and that 100 percent of the human family would enjoy at that time the highest technical advantages available to anyone. This second annual conference on design as a function of management will close Saturday.

"In 1900," Mr. Fuller said, "less than 1 percent of the human race enjoyed these advantages, as they existed at that time. At present 26 percent enjoy them, at a much higher level of development."

The curve is rapidly rising, according to Mr. Fuller, and the 50-percent mark will be passed in 1970, after which time more than half the human family will belong to the privileged class and the underprivileged will be a diminishing minority.

"This prospect makes the next 18 years extremely critical," he stated. "It should provide the focus of our foreign policy away from ideological considerations and toward the complete integration and utilization of world resources, so as to accelerate the increase of the 'haves' and the reduction of the 'have-nots.'"

Mr. Fuller said every family in the United States today had 1,600 inanimate slaves working for its benefit, and yet our utilization of available energy was only 4 percent efficient. As one example, he asserted that at any moment in the day, 1 million automobile engines were idling in the presence of red lights, wasting gas and energy.

He maintained that there was no basis for complaints of rising living costs.

"On the contrary," he added, "living costs are steadily going down because the dollar buys greater and great value. The life expectancy of the things we use is constantly increasing like our own.

"In 1913, my automobile tire was good for 1,000 miles. Today my tire, same weight, same size, is good for 30,000 to 50,000 miles at three times the safe speed."

[From the New York Times, June 28, 1952]

THE MATERIALS PROBLEM IN 1975

Some 18 months ago the President called on his Materials Policy Commission, headed by William S. Paley, chairman of the board of the Columbia Broadcasting System, to make a study of the long-term aspects of the materials problem. The commission's report has now been completed and published in 5 volumes aggregating some 800 pages. This week a digest of Volume I, The Foundations of Economic Growth and Security, was released for news publication.

This report presents the statistics and the current problems with respect to materials both comprehensively and interestingly. And few persons, probably,

will argue with its broad statement of policy, which the authors sum up as follows:

"The overall objective of a national materials policy for the United States should be to insure an adequate and dependable flow of materials of the lowest cost consistent with national security and with the welfare of friendly nations."

The stated purpose of this study, however, is to deal not with the situation that prevails today but with that (or those) a quarter of a century in the future. And it is here that it departs, it seems to us, from the merely self-evident to the unrealistic or not-at-all evident.

Since the authors of the report don't know what the materials situation will be in 25 years, or even 10 years, from now, they resort to straight-line projection. Reasoning from the premise that the immediate problem is one of insidiously rising real costs of material, they conclude, therefore, that the problem will be one of even more insidiously rising costs.

Yet the authors of the report themselves flatly challenge the validity of this conclusion elsewhere in the same volume. At one point they say:

"There is no way of predicting accurately how much demand there will be for any one material or group of materials in the future, because there are always the unknowns of changing price relationships, expanding technology, new products and the like. If the price of copper goes too high, more aluminum will replace it."

And at another point they remind us:

"Bayberries for candles, sperm whales for oil, and buffaloes for their hides were once essential to a United States economy which did not know of, or know how to use, the great deposits of petroleum under Texas, waterfalls in the Northwest, or phosphates in Florida."

Whether you devote 5 lines to it, or 5 volumes, the problem of materials—at least under a free enterprise system—is essentially a problem of technology. And no mathematical formula has yet been devised for plotting in advance the direction on the timetable of technological advance.

Deficit in Materials

TECHNOLOGICAL GAINS, INCREASED IMPORTS LOOKED TO FOR RELIEF

The writer of the following letter was editor of the Report of the President's Materials Policy Commission.

To the Editor of the New York times:

Your editorial The Raw Materials Problem in 1975 in discussing some aspects of the Materials Policy Commission's Report to the President summed up the problem as "essentially one of technology." The Commission shares your belief in the importance of technology to do many materials jobs, and devoted an entire volume of the report to The Promise of Technology.

The Commission made these further points:

The United States has crossed the great industrial divide and from being a Nation with a surplus of raw materials has become a deficit Nation. We used to produce more industrial materials than we consumed; now we consume more than we produce (net exports of raw materials in 1900 were 15 percent above consumption compared to 1950, when raw materials net imports were 9 percent below consumption). As samples of this trend, during the 1940's we became a net importer of copper, lead, zinc, timber and petroleum, all of which we formerly exported in large quantities. Recently we began to import iron ore, once the symbol of the materials self-sufficiency of the United States.

The current inadequacy of domestic supplies has been marked by an upward trend in the prices of many groups of materials, even after allowances are made for inflation—a reversal of the general downward movement in previous decades.

GROWING DRAIN ON RESOURCES

The meaning of these developments seems clear: The United States no longer turns out enough materials at low enough costs to satisfy its own needs. The cause is not so much that we have used up the materials—though we have consumed vast quantities—but that the United States economy is growing so rapidly its resources cannot keep pace. The great divide is behind us.

This much is history. But what about 1975?

The economies of the United States and of other free nations will continue to expand. In the past the economy of the United States, as measured in the total annual production of goods and services, has doubled every quarter century. Assuming that the economy may similarly expand in the next 25 years (an average annual increase of about 3 percent), the Commission made careful, even elaborate, calculations of what this would mean in terms of demand for specific materials in the decade 1970–80 (vol. II of the report, Outlook for Key Commodities, gives details).

These calculations may give estimates that are either too low or too high. The Commission believes that its estimates generally have been on the conservative side. But the accuracy of the guesses is less important than the fact that growth will occur—indeed, growth must occur if the Nation is to continue prosperous and strong. And this growth, if the experience of the last decade means anything, will require us to import larger amounts of more materials during the next quarter century.

The Commission estimates that these imports, by 1975, may well reach three times the level of 1950, based on dollars of constant value, and adding up to about $3 billion worth out of a total consumption of materials of $16 billion.

ECONOMIC COOPERATION

To the Commission, this increasing dependence of the United States on imports is a vital aspect of the materials problem. It creates an opportunity—and an imperative—for closer economic cooperation throughout the free world. The Commission directed recommendations toward encouraging private investment in materials development, reducing and eliminating tariffs and other barriers that impede world trade, and indicating steps that resource countries could take to pyramid general economic growth and welfare on sales of raw materials.

We must, by all means, encourage technology to work new miracles in expanding domestic resources, getting more out of the materials and resources we have, and keeping down costs. Equally, we must work to increase the flow of materials from abroad. Neither effort will by itself do the job.

As William S. Paley, Chairman of the Commission, put it, "Unless we face up to these facts in our economic and political thinking we cannot hope to have enough materials at sufficiently low costs, so that our economy may continue growing, our standards of living continue rising, and our military position continue and increase in strength."

NORVELL W. PAGE.

WASHINGTON, *July 6, 1952.*

[From the Washington Post, June 29, 1952]

CAN U. S. HALT ITS SLIDE INTO "HAVE NOT" CLASS?

By Alfred Friendly, Post Reporter

The report issued last Monday by the President's Materials Policy Commission is a case of a rather small hill laboring—there were five commission members and a relatively modest-size staff—and bringing forth a mountain, and a treasure-laden mountain at that.

The 5-volume report is likely to be one which will influence American policy for a decade. Many of its findings and recommendations will be the subject of controversy, but it cannot fail to have an enormous impact in a crucial field.

This is not strange in view of the fact that the report's point of departure is a devastating conclusion—an obvious conclusion when you see the figures, but one which the country has hitherto blithely overlooked. It is that after two centuries of building up our wealth on the basis of our abundant natural resources, we are moving swiftly to the role of a "have-not" nation in raw materials.

A fundamental and basic trend is being reversed, and the momentum is increasing. Some 130 years ago, all but a small fraction of our exports were raw materials; now, all but a small percentage are finished goods. All but a small part of our imports were finished goods in 1820; now, the bulk is crude materials.

The Commission, headed by CBS chairman William S. Paley, does not forecast a situation where "we will wake up some day to discover we have run out of materials and that economic activity has come to an end." The prospect is not so dire as that. It is, rather, that the low cost of raw materials which were at the

basis of our meteorically rising prosperity are now mounting. Each day it costs more and more, in "eral costs"—human effort, capital outlay and other productive energies—to obtain the metals and fuels on which our civilization is based.

The economic importance of this reversal of an all-important trend cannot be overestimated; the implications are staggering to our prosperity, future growth and even national security.

The difficulties of solving this problem over the next quarter of a century are bad enough, and perhaps no one should borrow trouble by looking still farther ahead. But it is hard to read the report without thinking of the situation 100 or 500 years from now.

The report itself does not do this. It confines its scope to the next 20 or 30 years and concludes that if enough intelligence and determination are shown, the problem can be licked—for that period. But what of the future?

As a jumping off place, consider the fact that this Nation alone has consumed more of most metals and mineral fuels in the last 25 years than all the world consumed in all of previous history. Consider next that the demand is still mounting; 25 years from now we (along with the rest of the free world) will be using up nonreplaceable materials at an average rate about 60 percent larger that at present.

We can comfort ourselves—for the short term—with the thought that there is probably a larger supply of useful minerals under the top mantle of our continent, in what the report calls the basement, than there is in the thin crust which we have been mining; that only a small fraction of the world's water power has been harnessed; that our coal reserves are good for hundreds of years; that more oil reserves seem to be found each decade than were used during that period.

Well and good. But someday—and not far distant in even the short perspective of civilized life—they will run out. Say it is 500 years hence, or even 1,000, which is only half as much time as has elapsed since the dawn of the Christian era, and only 30 generations ahead of us.

Will we by then be tapping molten iron directly from the earth's core? Or mining the moon? Or laboriously trapping metal pebbles from interplanetary space?

The report observes that technology and science have come to our rescue before, and when we needed them, but that it is a romantic notion to think this will always happen. The Paley Commission, at least, is by no means sure of it.

Itself firmly refusing to be drawn into such superspeculative speculation, the Commission has set about making recommendations for what to do about the immediate problem of the here and now, which is to say the next quarter of a century. Among its proposals, perhaps none will make such a lasting impression as those directed to one phase of the materials problem: getting more from abroad.

The proopsals (coming, incidentally, from 3 businessmen, 1 former Luce man and only 1 person who could be considered as tarred by the New Deal) constitute the most forceful statement of the foreign economic policy which the administration has been fostering ever since Cordell Hull began plugging for reciprocal trade agreements.

The recommendations, in fact, go far beyond calling merely for an expansion of the reciprocal trade agreements program. They ask bluntly for legislation permitting unilateral reduction or removal of tariffs on all materials which the United States needs critically.

The tariff on processed materials, the Commission finds, is just as bad—and often a great deal more ridiculous—than that on materials in their crude form. The report says:

"For some critical materials, duties are high: tungsten, fluorspar, aluminum, and magnesium. On other materials, the duties are low and some may be imported free of duty. * * * The duty levied bears no consistent relation to the crucial United States need for a particular material. * * *

"The typically higher duty on processed materials, as contrasted with ores or crude materials, presents another case in which the tariff schedule does not necessarily serve the best interests of the Nation. The ores of such minerals as antimony and chrome may be imported duty free, but the metal is subject to tariff; the same discrimination is applied to lead, manganese, petroleum and aluminum.

"Yet, unless the country in which processing would take place is judged too vulnerable from a security standpoint, the processing of ores abroad could be to our national advantage. This would be true whenever foreign processing costs,

in conjunction with the lesser charges for shipping more concentrated processed materials rather than bulky ores, would actually deliver lower-cost materials.

"To encourage imports of processed materials would be especially desirable when labor, transportation, and power continue short in the United States."

The report is at its best—and at its most acerbic—when it takes up the notion of self-sufficiency as a national security measure.

"The Nation not only is not self-sufficient now, but will become less so as the economy continues to expand and its demands broaden and increase. For many materials, self-sufficiency is either physically impossible or would cost so much in terms of diverted manpower and extra expenditure that it would make economic nonsense."

Subsidizing domestic high-cost producers when low-cost materials are available abroad, in the idea that that would contribute to national security, is like paying so much premium for an insurance policy that you have no money left for anything else, the Commission suggests.

Alternate solutions are always available, it says, and are much cheaper in terms of real costs. It recommends stockpiling, expanding capacity, long-term contracting abroad, etc.

Consistent with this point of view, the Commission naturally condemns "buy American" legislation—laws prescribing that State and Federal purchases must be of American-produced materials wherever possible—as a self-defeating hangover from depression psychology, when unemployment, not scarcity, was the chief problem.

Raw materials exist sufficient to meet the needs of the country and the rest of the free world during the next 25 years, the report declares. But there is no assurance that they will be produced automatically or in response to need. The problem is to get the investment, managerial skills, technology, and equipment flowing, so that the resources may be developed.

To this end, the Commission makes a series of specific recommendations, many of them looking toward the Government in the role of market stabilizer and, to a certain extent, guarantor. It also reads a blistering lecture to the underdeveloped countries that are screaming to be developed, pointing out what they are doing in outrageous tax laws, restrictions on management and, above all, threats of nationalization and expropriation, to deter instead of encourage the development they want.

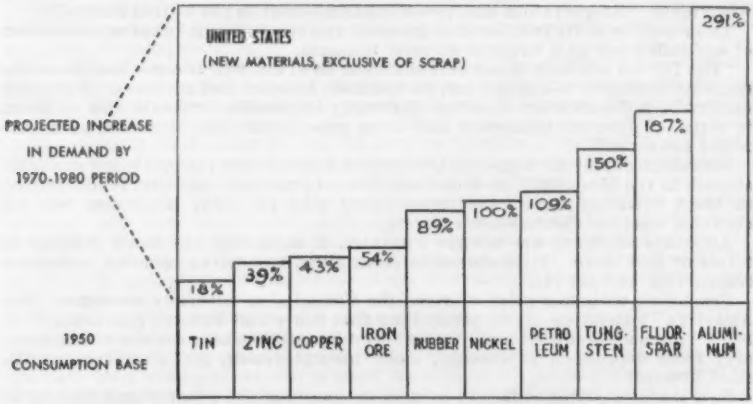
It is necessary if unpleasant, reading for the chancelleries of governments from Argentina to Iran, Peru to Morocco.

If the Paley Commission report does nothing else, it may bring about a new trend in economic study. Going back to fundamentals, it undertook to create policy on the basis of the supply and demand of physical resources—raw materials here and throughout the world.

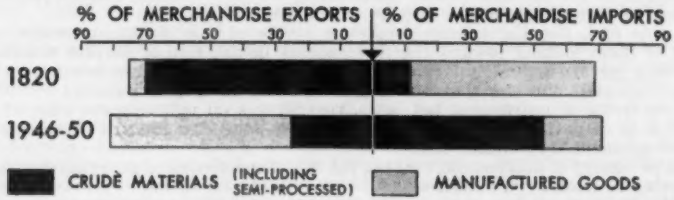
How startling that is becomes apparent when you think back on the nature of economic theory during the last 50 or 100 years. What were the subject of major inquiry? What were the theories on which national and social economics were based? What were the big names?

Well, in the last couple of decades it has been John Maynard Keynes and fiscal, budgetary and monetary policy. Before that, there was concentration on the price factor. About the time of the great depression, inquiry centered on business cycles, and the prophet was Wesley Mitchell.

MATERIALS DEMAND WILL RISE UNEVENLY



OUR EXPORTS OF 1820 ARE OUR IMPORTS NOW



Throughout there was emphasis on labor economics, on social welfare problems, on the theory of money, on concentration of industry, on competition. On darn near everything, in fact, except on the availability and consumption of the raw materials that made our industrial economy.

The Commission report, with its eye firmly fixed on the materials source, may bring about a new emphasis and a new school of economic thought.

A fascinating section of the Commission report concerns "recycling," or recovering in usable form, the world's mineral riches which, once laid down in convenient deposits, have been used and dissipated into almost hopeless dilution in the air and sea.

In this connection, the report discusses the spectacular ability of a thing called the tunicate, described not very kindly, as "a sedentary marine hermaphrodite." This beast, found throughout the seas of the world, has an insatiable appetite for the valuable metal, vanadium. Through a process of ion-exchange across its membranes, it can extract vanadium from sea water even though the concentration is less than three parts in 10 billion.

Are the tunicates and their hoarding the means by which to regather the world's vanadium supply after the Colorado and Peruvian deposits are used up and scattered? The idea has beguiled O. Frabjous Day, chief of the Paley Commission's Quicksand Division and general all-around expert on the nonstrategic uses of cigarette ashes, doldrums, and interstellar dust.

Day has produced the following report on the subject:

Let no one mock or denigrate
The moist, lethargic tunicate,
Or take the Senate floor to urge
It be the subject of a purge
By Peurifoy or Humelsine,
Because it is an androgyne.
Let none, with sniggers or with unction,
Condemn who does not know its function.

For He-She-It's no sideshow freak
—Here, bearded side; there, hairless cheek.
Let's grant, it is no thing of beauty,
And yet it has a noble duty,
Which it performs, nor slows, nor stops,
In timeless rounds of ion-swaps.
In ooze and dark it concentrates
What thriftless mankind dissipates.

You think it gross, corrupt, phlegmatic?
Not so; it plays a role ecstatic;
New Homestake lodes this beast is forging
Through countless eons of engorging,
Amassing treasure in the slime
For future Hearst or Guggenheim,
Production's savior and palladium,
The tunicate conserves vanadium!

Is gluttony a mortal sin
If serving cosmic discipline?
The answer, let us underscore,
Depends on what you glutton for.

[From Barrons, June 30, 1952]

THOSE TERRIBLE SHORTAGES

If the case of copper, discussed above, proves anything it is that Government planning with respect to raw materials ends not in order but absurdity. The case of copper, of course, does not stand alone. Ever since 1932 the Government has been trying to plan farm output: The result is the dragging weight of farm subsidies and the kind of maladjustment symbolized by the lowly potato. In industry planning has worked no better: The famous Controlled Materials Plan is currently in a state of collapse.

In view of all this the report of the President's Materials Policy Commission, issued last week under the title "Resources for Freedom," makes strange reading. The Commission is exercised by the fact that the United States and the world are currently chewing up a huge mass of raw materials. On the basis of population growth and other factors it then projects material needs into the year 1975 and not surprisingly comes up with even greater totals. From this it concludes that something must be done about the problem. Its recommendations include a whole list of palliatives: International commodity agreements; subsidies for exploration and development of mineral deposits both here and abroad; and large-scale Government sponsorship of technology.

It is not hard to perceive here a faith in Government action and planning which is wholly unjustified by all experience to date. The fact is that from the beginning of recorded history man has always faced shortages since economic resources are by definition scarce. The triumph of capitalism has been to find a way by which free men can constantly conquer the niggardliness of nature and create new wealth. The prerequisite for this continued advance is that the price system be given full play in equating supply to rising demand, and that Government let the process work instead of constantly interfering with it. The Commission had a chance to strike a powerful blow for the free market. Instead it became so obsessed with material resources that it all but forgot the vital resource of freedom itself.

[From Chemical Engineering News, July 7, 1952]

THE UNITED STATES AS A "HAVE-NOT" NATION

Writing in the 1952 "Facts and Figures for the Chemical Process Industries" (I&EC, June, page 1232), Elmer W. Pehrson, Director of Region IX (Foreign Minerals), United States Bureau of Mines, points out that "* * * from a mineral viewpoint we are indeed a 'have-not' nation in several indispensable minerals and for many of these there is virtually no hope for the United States to improve its position significantly through increased domestic output."

Pehrson is no "Johnny-come-lately" in predicting serious mineral shortages. He has been deeply concerned about our minerals position for years. Just about every statement made by him in his "Facts and Figures" article is substantiated by the five-volume report of the President's Materials Policy Commission, just issued.

The United States with but 6.3 percent of the world's population uses 45 percent of the world's minerals, and produces 50 percent of the world's industrial output. Pehrson in his I&EC article lists 38 important natural raw materials and shows that the United States is self-sufficient in only 9, and produces only 10 percent or less of its needs of 12. These figures certainly indicate that minerals, using that term in its broadest sense, represents one of the most serious and challenging problems that this country faces in the years ahead, with an anticipated increase of the population of 40 to 50 millions in the next quarter of a century.

We hope the voluminous report of the President's Materials Policy Commission will receive prompt and adequate attention. It is a valuable document that should have an enormous impact on American thinking and should influence American policy for a decade or more. It is devoid of sensationalism; it is not written as a "thriller," but it does present the devastating conclusion—we have in the past been wasteful of our natural resources of minerals and face a doubtful future if we do not husband what we have left.

It is quite apparent that for many decades we have blithely ignored the perfectly obvious. Every intelligent person has known that the past 75 years of industrial expansion have pyramided greatly the demand for minerals, yet most of us have blindly assumed that supplies were inexhaustible. The machine and chemical age has wrought, as Pehrson points out, "one significant change, in that major emphasis has shifted from precious metals and gems to iron ore, petroleum, sulfur, and many other critical industrial raw materials of mineral origin."

We have built a great Nation on the foundation of these natural commodities. We have created from them the highest standard of living the world has ever experienced. With them we must continue our present industrial leadership so we can maintain peace in a world threatened by Soviet imperialism. We must do this in the face of an ever-increasing world population and a very sizable increase in that of the United States.

The latter figure is expected to be 193 million by 1975. If we assume no greater rate of increase than the annually compounded 3 percent rate of the past, then our gross national output 23 years hence is expected to reach $566 billion a year in terms of 1950 purchasing power. The corresponding figure for 1950 was $283 billion.

The soaring demand for raw materials implied in this purchasing power only suggests the extent to which we must improve present techniques of discovery and development if we are to maintain and even improve present standards of living. If production costs soar too high, the inevitable result will be a gradual decline in the existing standards. The President's Materials Policy Board estimates that by 1975 minerals as a whole, including metals, fuels, and nonmetallics, will be in twice as heavy demand as in 1950.

There is no easy answer to the problem of meeting these growing demands in this country in the face of decreasing availability of many of the most vitally important natural raw materials.

We must learn to be less wasteful of such irreplaceable resources; we must accept the necessity of re-using these products many times over; we must improve our techniques of discovery and development of mineral resources.

The chemist and the engineer will play an ever-increasingly important role in this fight for national and international survival, whether we live through years of peace or war, or a mixture of both. We must find many new substitutes and many new synthetics. We must learn how more economically to use farm products as industrial raw materials. Improved chemical and physical methods

must be devised to permit us to extract every last ounce of mineral wealth from Mother Earth, including relatively low-grade sources now considered uneconomic.

Even if we accomplish all these miracles, we will be far short of our needs if we do not accept the global viewpoint in regard to natural raw materials.

The report states that raw materials exist sufficient to meet the needs of the country and the rest of the free world during the next 25 years. However, there is no assurance that they will be produced automatically or in response to need. The problem is to get the investment, managerial skills, technology, and equipment flowing, in order that the resources we know are available may be developed.

The problem is not just one for the United States—in nearly every respect it is one of international significance. Stockpiling at best is but a temporary although a very important expedient. If the free world is to progress, it is necessary that all nations realize a community of interest in the availability of natural raw materials. No one nation can live in complete isolationism, for no nation has anything like self-sufficiency in the many varied commodities now necessary to maintain modern industrial productivity.

As we see it, this problem of providing indefinitely adequate amounts of natural raw materials requires close cooperation between industry and government in this country and a high order of statesmanship between nations of the free world. Very basically what is needed most is a lessening of self-interest and selfishness in many places, too numerous to mention.

The editors of Chemical and Engineering News consider the report of the President's Materials Policy Board to be one of the most momentous documents ever issued. Beginning in this issue we are presenting the first several articles summarizing the salient elements of the report.

[From Chemical and Engineering News, July 7, 1952]

Resources for Freedom—Foundation for Growth and Security

UNITED STATES MOVES TOWARD HAVE-NOT STATUS—PRESIDENT'S MATERIALS POLICY COMMISSION BELIEVES TECHNOLOGICAL DEVELOPMENTS CAN IMPROVE MATERIALS PICTURE

Soaring demands, shrinking resources, the consequent pressure toward rising real costs, the risks of wartime shortages, and the strong possibilities of an arrest or decline in the Nation's standard of living is a brief outline of the materials situation facing this country in the next 25 years.

While this gloomy picture has often been described, no report has done it so or decline in the Nation's standard of living is a brief outline of the materials Policy Commission. Headed by William S. Paley, the five-man commission has just completed a monumental five-volume report setting forth results of an 18-month study of the broader and longer range aspects of the Nation's materials problems.

"Resources for Freedom," the title of the series, was prepared with the aid of government, industry, and universities.[1]

The separate volumes deal with a broad analysis of the materials problem, studies of specific materials, studies of energy resources, opportunities for technology to resolve some of the more troublesome problems, and some of the basic studies used by the Commission.

FOUNDATION FOR GROWTH

The basic problem today in the United States centers about the fact that consumption of almost all materials is expanding at compound rates and is thus pressing harder against resources which, whatever else they may be doing, are not similarly expanding.

This Nation is now in the position of being unable to satisfy its own requirements as well as it did formerly.

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[1] In addition to Foundation for Growth and Security, which is vol. I of the 5-volume series, Resources for Freedom, the series includes: vol. II, The Outlook for Key Commodities; vol. III, The Outlook for Energy Sources; vol. IV, The Promise of Technology; and vol. V, Selected Reports to the Commission. They are available from the Government Printing Office, Washington 25, D. C. Prices for individual copies are: Vol. I, $1.25; vol. II, $1.50; vol. III, 50 cents; vol. IV, $1.75; and vol. V, $1.25.

In preparing its report, the Commission assumed that the principal of growth would be followed in the United States, that private enterprise is the best medium for performing industrial tasks, in cooperation with and with some help from the Government, and that the destinies of this country are bound with those of other free nations.

A self-sufficiency policy is not valid, a policy of lowest cost acquisition of materials wherever secure supplies may be found is essential. Only in this way can this country ensure an adequate and dependable flow of materials at the lowest cost consistent with national security and with the welfare of friendly nations.

The Commission states that the United States appetite for materials is gargantuan—and so far, insatiable. The Nation now uses over 2.5 billion tons of materials each year, or approximately 18 tons per person per year. This includes fuel, building materials, food, fiber, pulp, metals, and nonmetallics.

The principal opportunities available to improve the present materials position lie along three lines: utilizing domestic resources of materials and energy by overcoming technological, physical, and economic barriers; more efficient designs and processes for using materials and a shift toward use of abundant materials in place of scarce ones; and imports from abroad.

COST IS MAIN PROBLEM

Real costs, which include human effort and capital outlay, will determine to a great extent the quantity of materials to be available in the future. Since 1940, there has been a reversal in the decline in real costs for many items, chemicals being an outstanding exception. If real costs are not kept down, the production of raw materials will be affected. Engineering and technology can help offset some, but not all, of the real cost increases.

STRENGTHENING DOMESTIC RESOURCES

This Nation has only 9.5 percent of the free world population, and yet produces about half the total output of industrial materials. With rich resources, it has been difficult to accept the possibility of becoming a net importer. The fact is that the Nation is becoming more dependent on imports. By 1975, one-sixth of the 3 billion tons of materials used each year may be imported.

The Nation's economy is complex and is ever-changing. While it is not possible to predict future needs and uses for materials, certain things can be done. More can be learned, for example, of the Nation's mineral resources, and of the ways of altering mineral substances—for example: conversion of solid fuels to liquid and gaseous fuels. Efforts can be made to see that renewable resources such as timber are renewed.

In addition to these problems, there is an ever-present question of the Nation's security, which has decided effects on policies relating to materials.

The Commission estimates that there will be an increase of 50 to 60 percent for all materials by 1975. Mineral needs, however, will jump 90 percent. Although wood production can be increased, the increase will not be sufficient to meet the high demand and tight supply expected in 1975. Water consumption by industry now runs 80 billion gallons a day. This will increase 2.5 times by 1975. Rainmaking and desalting of sea water may become means of alleviating this shortage. With respect to agricultural products, the commission believes that the expected 40 percent increase can be met in part by technological developments including artificial rainfall and application of photosynthesis.

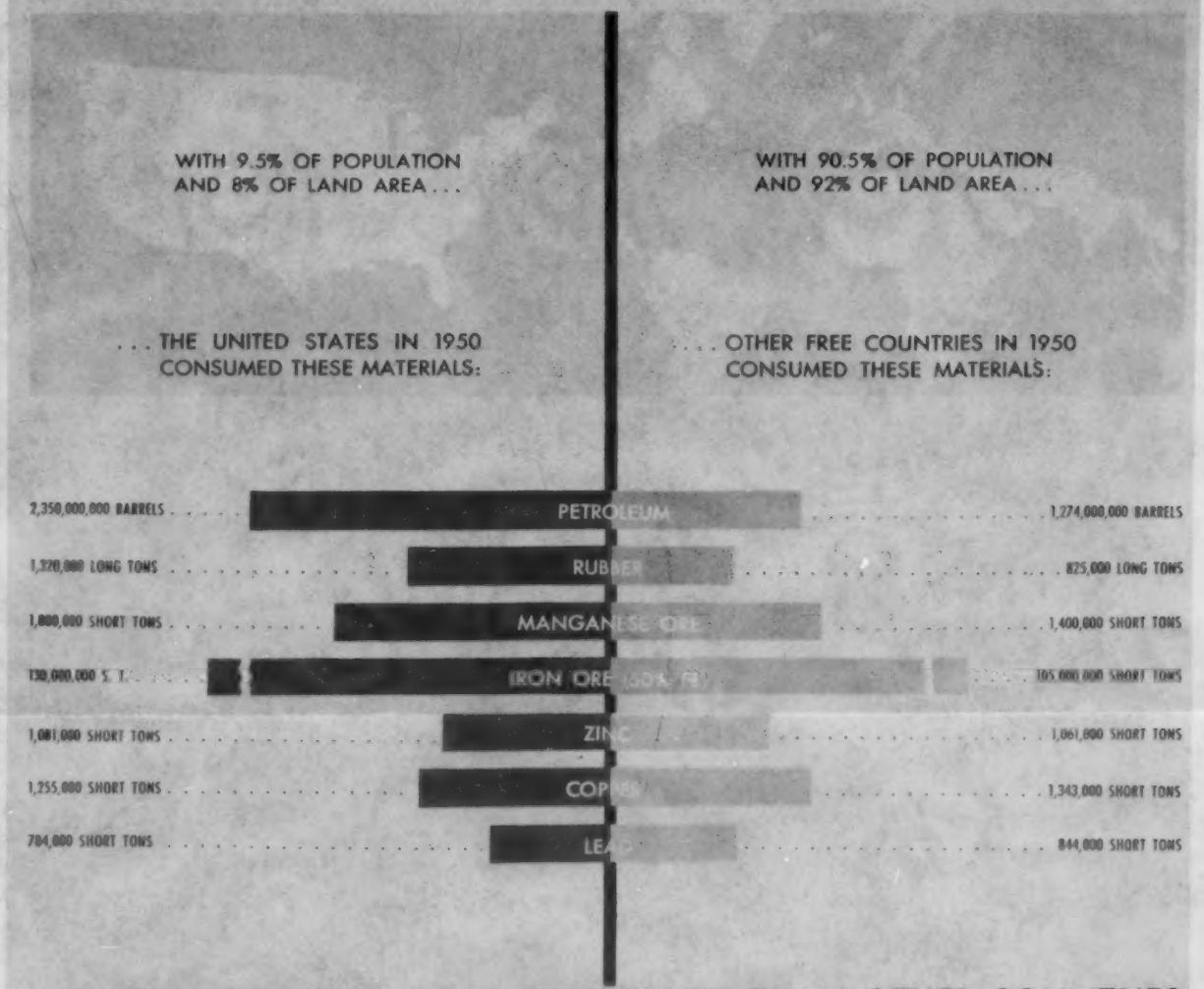
PROMOTING FREE WORLD EXPANSION

United States dependence on heavy imports of materials has developed in the past decade. The expected doubling of United States total output of goods and services by 1975 will require a 50 to 60 percent increase in supplies of materials. Even though domestic resources are used to meet 75 to 85 percent of needs, there will still be an increasing demand for materials from other nations.

The basic question to be considered is whether capital, equipment, technology, and management skill will promote expansion of low-cost sources of supply to meet demands.

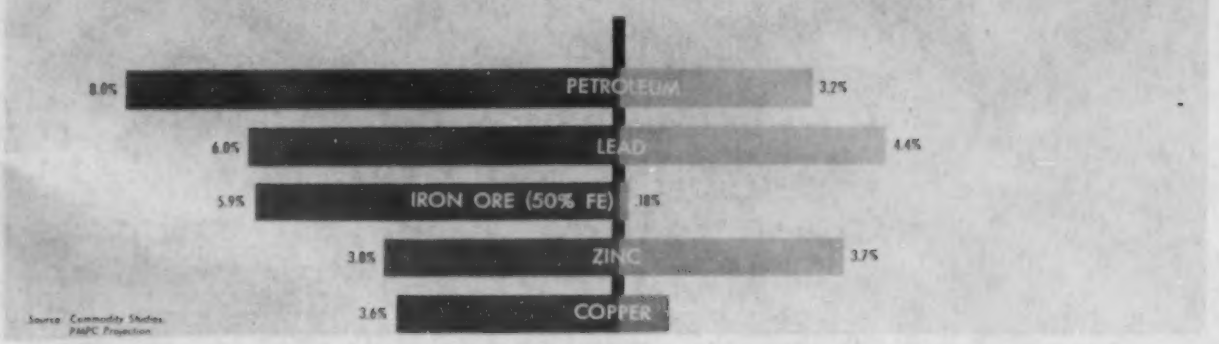
The United States, through private investments, technical assistance, and loans, can help. The Government can help by working with foreign governments to overcome some of the obstacles to private investment abroad.

U. S. IS FREE WORLD'S BIGGEST MATERIALS CONSUMER



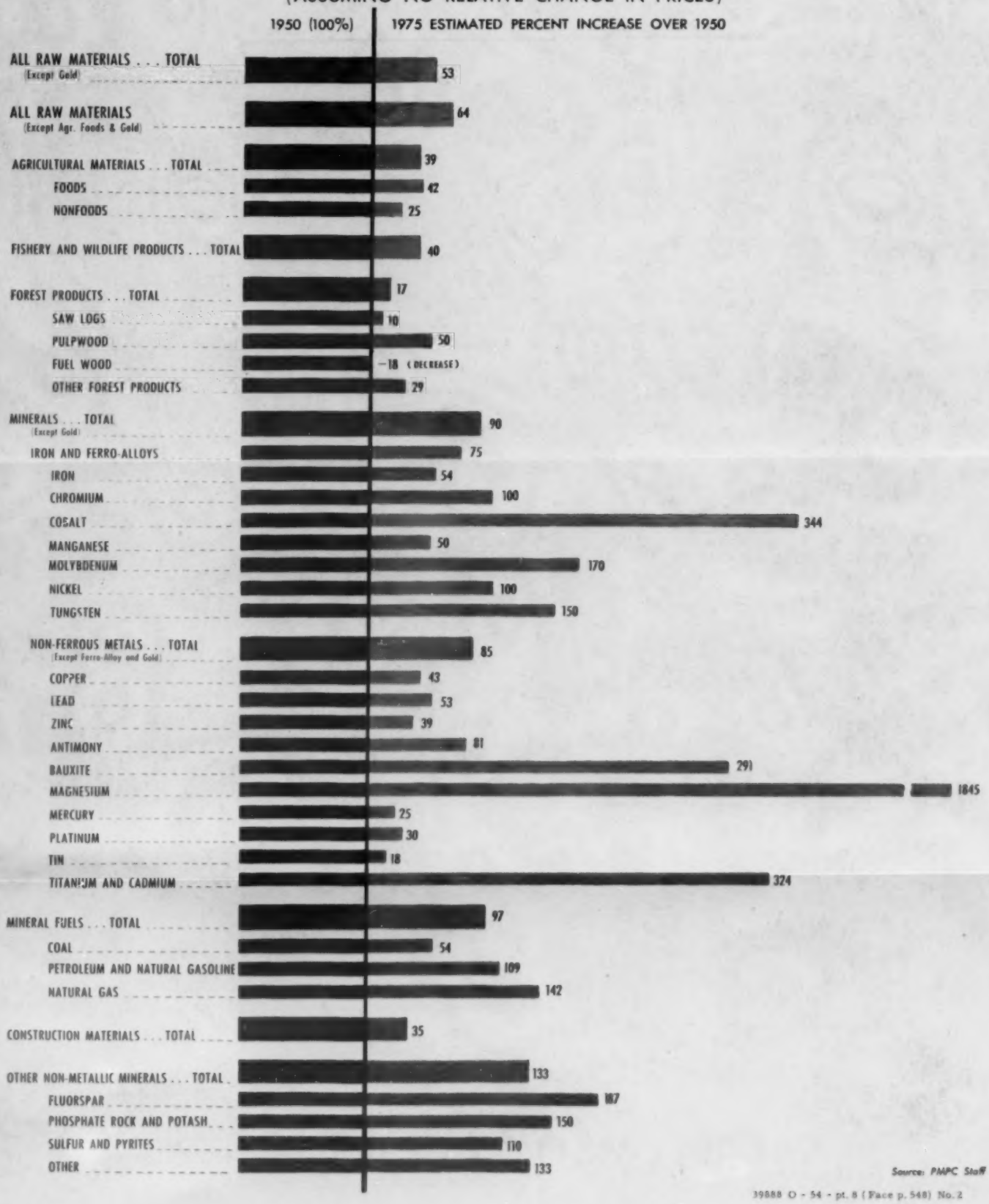
...AND U. S. IS USING UP RESERVES FASTER THAN OTHER COUNTRIES

(1950 PRODUCTION AS PERCENTAGE OF KNOWN RESERVES)



HOW U. S. CONSUMPTION OF MATERIALS MIGHT RISE BY 1975

(ASSUMING NO RELATIVE CHANGE IN PRICES)


1950 (100%)
1975 ESTIMATED PERCENT INCREASE OVER 1950
ALL RAW MATERIALS . . . TOTAL (Except Gold) 53
ALL RAW MATERIALS (Except Agr. Foods & Gold) 64
AGRICULTURAL MATERIALS . . . TOTAL 39
FOODS 42
NONFOODS 25
FISHERY AND WILDLIFE PRODUCTS . . . TOTAL 40
FOREST PRODUCTS . . . TOTAL 17
SAW LOGS 10
PULPWOOD 50
FUEL WOOD −18 (DECREASE)
OTHER FOREST PRODUCTS 29
MINERALS . . . TOTAL (Except Gold) 90
IRON AND FERRO-ALLOYS 75
IRON 54
CHROMIUM 100
COBALT 344
MANGANESE 50
MOLYBDENUM 170
NICKEL 100
TUNGSTEN 150
NON-FERROUS METALS . . . TOTAL (Except Ferro-Alloy and Gold) 85
COPPER 43
LEAD 53
ZINC 39
ANTIMONY 81
BAUXITE 291
MAGNESIUM 1845
MERCURY 25
PLATINUM 30
TIN 18
TITANIUM AND CADMIUM 324
MINERAL FUELS . . . TOTAL 97
COAL 54
PETROLEUM AND NATURAL GASOLINE 109
NATURAL GAS 142
CONSTRUCTION MATERIALS . . . TOTAL 35
OTHER NON-METALLIC MINERALS . . . TOTAL 133
FLUORSPAR 187
PHOSPHATE ROCK AND POTASH 150
SULFUR AND PYRITES 110
OTHER 133

Source: PMPC Staff

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HOW U.S. CONSUMPTION OF MATERIALS

SUPPLYING ENERGY FOR ECONOMIC GROWTH

In the past 50 years, while the labor force has doubled, output of goods and services has increased 5 times and total energy use has increased 4.5 times. By 1975 primary energy suppliers must double from the equivalent of 1,300 million tons of bituminous coal per year to 2,600 million tons. In the event of war, energy demands, particularly of liquid fuels, would increase tremendously.

While the development of atomic energy and solar energy shows encouraging progress, chief dependence for the next 25 years will probably remain on fossil fuels—petroleum, natural gas, and coal—and hydropower.

The increased demand for fuels will be for secondary forms of energy such as electricity, gasoline, and coke rather than primary fuels, especially coal. Because of conversion losses, use of primary fuels will also increase. As increasing difficulties are encountered in meeting energy needs from other sources, heavier reliance will be placed on coal, the big safety factor in the Nation's energy outlook.

TECHNOLOGY: RESOURCE FOR THE FUTURE

The growth of technology in the present century has dwarfed all previous accomplishments of its history. Technology, for example, has increased the quantities of useful energy obtainable from a given amount of coal, has saved copper and steel by improving generator output, and has obtained fuels and chemicals from wasted natural gas. Technological developments have, however, brought into being new products which require increased supplies of raw materials.

The problem of technology is not alone one of science but one of economics. At a price, it is possible to produce gasoline from coal, feed from sawdust, and atomic power. Unless costs are kept down, these developments will not be forthcoming.

There is a great gap in the field of materials research. Industry does not undertake such research until it is hard pressed for materials, while government acknowledges the gap but has not bridged it. Planned and increased research in this area is indispensable.

Technology's future tasks include new techniques to discover minerals, to bring into use materials not presently used, to apply the principle of recycling more and more broadly, to learn how to deal with low concentrations of useful materials, to develop and use more economically renewable resources—for example, solar energy—and to lessen or eliminate need for scarce materials by substituting more abundant ones.

TECHNOLOGY'S TASK

How and by whom will these possibilities be achieved? The Commission believes that not only physical scientists and engineers, but all other segments of the labor force as well, are needed.

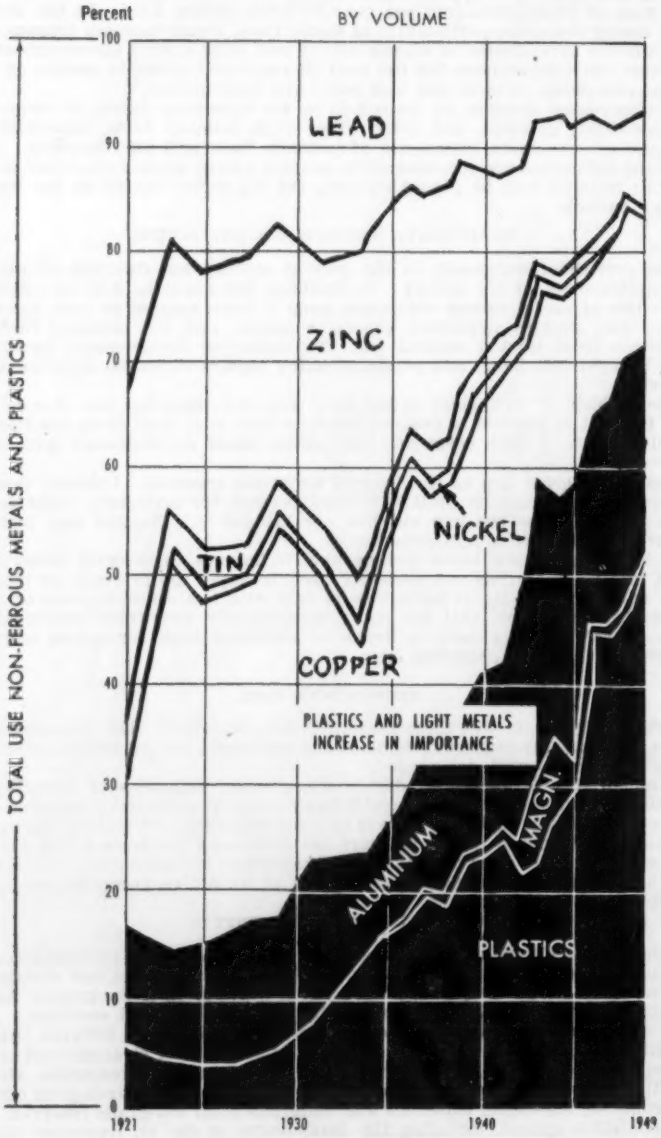
Although the Government today is the greatest supporter of scientific and technical research, this great force is headless with little top direction. With respect to materials research, there is no coherent policy. In spite of the number of Federal projects in this area, there are still many problems which fall into a no-man's land. Better coordination of materials technology is essential, and the Commission recommends establishment of an active group to handle this function.

FOUNDATION FOR SECURITY

Although the Commission is concerned with the long-range-materials picture, it noted that our military preparedness is a long-range program designed to cope with the needs of a possible third world war. Even if the present Korean situation were eliminated, the materials problems will still continue.

To assist in preparing for an emergency, the Commission believes that the Nation must maintain on a permanent basis a stockpile of strategic and critical materials, "stockpiles" in the ground of proved mineral resources, standby facilities to extract and process them, and a "stockpile" of technological methods for producing substitute materials and materials from low-grade reserves. The transportation system, including the development of the St. Lawrence seaway, must be expanded.

TECHNOLOGY BRINGS NEW MATERIALS TO THE FORE



Source: Bureau of Mines, Stanford Institute of Research.

CONCLUSION

The Commission states that with respect to the materials problem—its forms will alter, its severities may be controlled, and partial solutions will present themselves—but the forces that brought them into being will increase rather than diminish. The materials problem, therefore, may never be solved, but it can be compensated if recognized.

The problem is a continuing one and must be handled on a continuing basis. The National Security Resources Board, the Commission feels, should be responsible for overall authority with respect to analysis and coordination of policy with respect to domestic and foreign resources, energy, technology, and security.

[From the New York World Telegram, August 4, 1952]

PALEY REPORT

SCHEME FOR GOVERNMENT CONTROL OF WORLD COMMODITIES MARS REPORT ON VITAL RESOURCES

(By Lawrence Fertig, writer on economic affairs)

There may be a case on record of a Government-appointed commission to investigate economic affairs which recommended freer play for natural market forces and less interference by fumbling, inefficient government, but if so this writer has yet to come across it.

Bureaucrats in many countries from Argentina to Britain have tried to mold economic forces into their special plans with dire results to their own people. Despite their tragic failures at home, they propose extending their plans on a grander scale—to the international sphere.

The plans of "experts" always seem so logical and simple on paper, but things never work out according to their ideas. The best way to get maximum production and to allocate scarce resources is still, strangely enough, by following the simple law of supply and demand.

It is unfortunate indeed that the President's Materials Policy Commission, headed by William S. Paley, has followed the tradition of all government-appointed commissions and recommended international control of basic materials. It is unfortunate because this proposal mars a massive, five-volume report which contains many constructive recommendations that might well be the basis for congressional action.

MANY SOUND SUGGESTIONS

The Commission makes many sound observations about conservation policies, about tax laws to stimulate exploration and development of resources, about the folly of the Buy American Act, about percentage depletion allowances, and a great many other subjects which affect the natural resources we are consuming at such a rapid rate.

Also, the Commission pays its respect to the function of the free market and of purely private investment in producing more materials. But after this glowing account it suddenly discovers many reasons why the market by itself cannot meet our needs, and, before you know it, jumps to the conclusion that while the market is all right within narrow limits governments must come to our rescue in the future if we are to get all the materials we need.

The aim of the Paley Commission is to achieve a greater and steadier flow of materials from domestic and foreign sources. It estimates that by 1975 we will need 110 percent more oil, 45 percent more copper, 34 percent more cobalt, 61 percent more lead, 110 percent more sulfur, etc. These figures are based on the assumption that we will have a labor force of 82 million, a population of 183 million, and that we will progress at about the same rate as we have in the past.

Many of these estimates are bound to be wrong. What happens to oil, for instance, with the coming use of atomic energy (which isn't even listed in the first volume index)?

These assumptions are open to grave question, but certain it is that we will need larger supplies of raw materials. How can these be stimulated?

The solution offered by the Commission is worse than the ailment it attempts to cure. In the first place, it favors multilateral agreements among governments which would guarantee floor and ceiling prices for major commodities, similar

to the present International Wheat Agreement. Pacts of this type appear on the surface to work all right as long as prices are fairly stable, but somebody has to foot the bill when the agreed price varies greatly with the market price.

Under the wheat agreement, for instance, the United States Treasury paid out more than $600 million to buy wheat from our own farmers and deliver it to foreign nations at the agreed-upon price. Suppose there were agreements for many commodities and the market fluctuated widely—how long would such agreements hold? Who would foot the bill? How much distortion would be caused by the false price?

SECOND PART IS WORSE

The second part of the Commission's plan is even worse. It proposes that an international commission be empowered to buy "buffer stocks" of important commodities in order to prevent their price from sinking too low, and to sell them when the price becomes too high in the opinion of the Commission. In addition, there would be restrictions on production with "quotas" for some commodities.

Thus, a small group of men would substitute their judgment for the free market and practically run a cartel. Production would be affected. The oppressive weight of vast stockpiles would overhang the market, restraining the activities of businessmen and affecting output in many ways. No one would be able to gage the future unless he were privy to the mind of the Commission.

In some commodities, huge surpluses would be created because changes in buyers' preferences and in technology would catch the planners flatfooted. This is an old, old story, and history is replete with the record of many such fiascos.

Providing for all the materials we need by the free-market system may have its difficulties, but these are nothing as compared to what would happen if we substituted for the market the guesswork of a few Government-appointed commissioners, as suggested by the Paley Commission.

[From U. S. News & World Report, August 15, 1952]

NOT ENOUGH MATERIALS FOR UNITED STATES

(Interview with William S. Paley, Chairman, President's Materials Policy Commission)

LOW-COST IRON, OIL, LUMBER RUNNING OUT—DEALS FOR IMPORTS REQUIRED—WORLD'S NEEDS ON RISE

EDITOR'S NOTE.—Must this country's progress slow down for lack of raw materials?

How is the standard of living to keep rising, with still more houses, autos, and gadgets, if the Nation is running out of the stuff to make those things?

William S. Paley was interviewed on these problems in the conference room of U. S. News & World Report. He is Chairman of the President's Materials Policy Commission, whose massive report on the outlook from now to 1975 followed 16 months of research.

William S. Paley, at 27, tried radio advertising for his father's cigar company and then bought a small network, which he renamed Columbia Broadcasting System. That was in 1928. He has headed CBS, as president or board chairman, ever since.

In the war he was deputy chief of psychological warfare at General Eisenhower's European headquarters, with the rank of colonel.

Now 50, Mr. Paley was chosen last year by President Truman to head the study of the Nation's and the world's raw materials.

Question. Various governments of the world control very vital raw materials today, don't they, Mr. Paley?

Answer. As a nation we have crossed the great industrial divide. We used to produce more raw materials than we used, but now we are using more than we produce. And this is not a temporary situation. In 1950, we had to import about 10 percent of the raw materials we used, and they cost about $900 million in prewar dollars. We estimate that by 1975 we may have to import about three times as much.

Question. That is, 30 percent of our raw materials?

Answer. No, 3 times as much in quantity, but only twice as much in percentage—20 percent—because our total consumption will have increased a lot by then. We estimate that, in terms of prewar dollars, we'll be importing a total of about $3 billion out of a total of $16 billion spent for materials.

Question. What does that mean?

Answer. The inferences from these facts are plain.

First, we will have to become even more worldminded in the future than we have been in the past. That means we should make new bargains with our friends throughout the free world. We will not have to be distress buyers, because there are other solutions if import conditions are unfavorable, though they are more costly. But if they are more costly to us, they are even more costly in terms of lost opportunities to the nations we are likely to depend on for more materials. However, we feel that by cooperating more fully with our friends throughout the rest of the free world we can develop additional sources of raw materials for us as well as for other industrial nations, and, at the same time, help resource nations to develop their ecenomies better and faster.

The second broad inference is that we have to do a better job at home. We have to strengthen and conserve our domestic resources, and more particularly we have to use technology to get more work out of each pound of material and each unit of energy. I say that unless we face up to these new facts in our political and economic thinking, it will be very difficult for us to get enough materials at low enough cost to maintain a growing economy, a rising standard of living, and a strong military position.

Now, coming back to your question, there have been some important manmade impediments in the way of accelerated development of foreign resources. Many of them are created in resource countries, and many of them are created here.

Question. Such as tariffs and legal restrictions on exports and the like?

Answer. Yes, those and the Buy American Acts and inequitable tax situations for some investors so far as the United States is concerned. Abroad, things differ from country to country. Private investors complain that resource countries put limitations on their ownership and restrict management operations. They complain against taxation and other legal exactions, and about regulations on currency, foreign exchange, and trade. Most of all, investors seem to fear a change in the rules of the game after their investment is made, or that their investment will be nationalized without proper compensation. Our point is that all nations have a lot to gain by removing these impediments.

Question. Then, the days of "self-sufficiency," as you see it, that for generations we have felt that we had, are over?

Answer. Yes. Our technical people figured that even if we had what we started with—all the materials that were in this country to begin with—it still wouldn't be enough for another 25 years of growing at the rate we've maintained for the last half century. So self-sufficiency is out of the question, and from the standpoint of our own self-interest, as well as that of the whole free world, self-sufficiency is an undesirable goal of public policy.

Question. To think that we could be self-sufficient?

Answer. Or that we would want to be self-sufficient. It would mean that for many materials we have to pay more in real cost for what we need. We think that striving for self-sufficiency will lower our standard of living rather than raise it. Under conditions like that, trying for self-sufficiency is just setting up a self-imposed blockade, and that's economic nonsense.

Question. By cost, do you mean that if we wanted to develop these materials in this country we would have to pay a greater price than by buying them from remote areas of the world at lower price?

Answer. Yes. When I say "real cost"—what the economists call "real cost"—I mean the amount of man-hours and capital that go into creating a pound of material or a unit of energy. The more we spend in this sense on something that can be obtained abroad at a cheaper cost, the fewer man-hours and less capital we have left to produce higher-value products here.

Question. Can we illustrate with a particular commodity, say, bauxite? We know there are high-cost ores in this country that we can use if we have to, but basically we can get it cheaper outside the United States, isn't that correct?

Answer. That's a very good illustration. I'd say that if we have to dig harder, put more man-hours and invest more capital in machinery to get aluminum out of clays in this country than it would cost us to import aluminum

or bauxite from overseas, then the United States would be wasting manpower and capital.

WHERE MATERIALS ARE

Question. What are the areas where you visualize most of this raw material to come from? Africa? South America?

Answer. Africa, North and South America, the Middle East, and southeast Asia. They're the principal underdeveloped areas.

Question. What are the principal commodities that are in an unsatisfactory condition today?

Answer. If you want to get dramatic about it, you could talk about the additive alloys—cobalt, columbium, and such materials as high-grade quartz crystals, mica and industrial diamonds—those materials for which we are largely or completely dependent on foreign supply. But the thing that bothers me most is the lessening adequacy of low-cost supplies of the staples, such as iron, copper, zinc, petroleum, lumber, water for industries, and so forth.

Question. Petroleum?

Answer. We are importing 8 percent of our petroleum right now.

OIL PROBLEM OF UNITED STATES

Question. Aren't we discovering more every year, more than they thought they would ever discover?

Answer. New reserves have kept ahead of our rate of withdrawal. But we are now importing petroleum, and in the next 25 years we will be probably importing much more. As a matter of fact, you can get into an awfully hot argument as to how long the supply of oil in the ground will last. I only know that every barrel taken out of the ground means one barrel less, and some day there's going to be an end. It is not going to go on forever.

Question. The Interior Department has been telling us for years that we are going to run out in 20 years, but we always seem to come up with a new source of supply.

Answer. Yes, I know; that's the way it's been, but, as I said, it can't go on forever. Moreover, the costs of finding and developing oil are rising. The Independent Petroleum Association says this trend toward higher crude-oil replacement costs will keep on.

Question. But isn't it true that while we are importing 8 percent of our oil we are also exporting a certain amount?

Answer. The 8 percent is net imports.

Now, the oil situation is a very good case of how substitutions can come to our rescue. We have great quantities of shale in the Far West and shale can be converted into oil and oil-products. We recommend that we increase our effort to get more technological know-how on the conversion of shale to oil at reasonable costs on the basis that someday, for security reasons if no other, we will have to turn to that. We already know how to do it, technically; the problem is to get the costs down. We're not far off now.

Coal also can be converted to oil products, but the conversion cost is even higher than for shale. The prospects are good for the future, though.

Question. Would you name any other things that you think we are going to be short of?

Answer. There are only two metals that we are completely self-sufficient in, and they are molybdenum and magnesium. Of the hundred materials that we use, in round figures, we have to import about one third, we produce part and import part of about another third, and we are self-sufficient in about one third.

And there's industrial water—water used by industries for cooling or washing, or as a material. Industry will be needing 2½ times as much in 1975—something like 200 billion gallons a day. Shortage of good water is becoming a key problem in locating plants.

And timber. We made recommendations to protect forests better and to assure good management. In the long run we can grow as much as we need year by year, but we aren't doing it now.

COAL'S HIGH RANK

Question. What about coal? We are not going to run out of coal, are we?

Answer. We are better off in coal than in most raw materials. Coal has been going down in proportionate use among the fuels, but we feel that it is going to have a substantial rise in the future. The problem is to reduce costs so as to

make coal more competitive. We need a lot of research on how to mine and transport coal, and to use it more efficiently. Actually coal is a tremendously flexible source for all kinds of energy—electric power, oil, gas—and also important chemicals. It's one of our greatest assets if we use it well.

Question. How dangerous is the iron-ore situation?

Answer. I wouldn't call it dangerous, although costs could be forced upward. We are beginning to import iron ore from South America and Africa. Deposits in Canada and Labrador are being developed. Our imports will have to increase and may reach 65 million tons out of a total demand of perhaps 200 million by 1975. At home we still have high-grade deposits and we also have large reserves of taconites—a lower-grade ore. The problems will be to hold down costs and, from a security standpoint, to get our ore from militarily safe areas. You can't easily stockpile several years' supply of iron ore.

To the extent that areas in other countries are safe areas we are in pretty good shape on iron ore, and as I have said we have the taconites to fall back on.

Question. This projection of the next 25 years' possible shortages and the materials needed for production looks only at our own increased demand, doesn't it?

Answer. No, we estimated the increased demand for the rest of the free world as well. Foreign estimates are much rougher, but we took the free world into consideration—for, as we said, we no longer can have a purely domestic policy on materials. We must think in terms of a world policy with domestic aspects. The world is becoming more interrelated all the time.

Question. Do you think the rest of the world will be using greater amounts of raw materials than heretofore?

Answer. As its industrial development occurs, particularly in some of these underdeveloped areas, it will. We figure, for instance, that if the rest of the world acquires the same standard of living as we have, the raw-materials requirements for the world would be six times the present use. In general we think that the needs of all other countries will average about the same rate of increase as ours will.

Right now the United States uses about half the materials produced in the free world. By 1975, we'll be using a lot more in quantity, but because other countries will be using more, too, we probably won't be taking quite half the total.

Question. Has anybody guessed how soon we might run out of materials for the free world on that basis?

Answer. If we all act intelligently, the free world can have plenty of materials for the next 25 years, and that's as far as we looked ahead. But I want to say this: The real problem isn't that we may run out of materials—the problem is what will it cost us to get materials. The harder we have to dig for materials, the poorer grades we have to use, the more man-hours of labor and the more capital will be put into obtaining them. The necessity for this extra labor and extra capital will have an adverse effect on our economy and, by extension, on our standard of living. So it comes down to a cost problem more than it does to a physical-supply problem.

Question. Isn't that a self-limiting factor that may be desirable—that the higher the cost the less you use?

Answer. No, because the less we use the less our industrial machine produces. It would cause a decline in our economic and military strength. The continuation of our economic growth, our rising standard of living, and military preparedness all depend on more materials at low costs.

IMPORTANCE OF SUBSTITUTES

Question. How deeply did you go into the possibility of substitutes?

Answer. We went into it very thoroughly. We devoted a volume to technology? We must work in three broad areas if we are to have the materials to satisfy our needs. Technology must play an important part in the first two and will be used extensively in the third as well.

The first area covers domestic materials; finding more, getting better use out of what we find, wasting less and taking better care of our renewables. For example, we are getting relief from the introduction of synthetics and are now using some of the elements which hadn't been put to work previously. Out of 90 elements, we are using 30 to a large extent, 30 in a minor way and 30 not at all. So finding more and getting more out of what we find covers one opportunity for relieving our materials problem.

The second area deals with shifting our pattern of use. Aluminum, which 20 or 30 years ago was used very little, is now used in many ways and is replacing steel and copper in many cases. And there's a new metal coming in—titanium. It's less corrosive and stronger than aluminum and 42 percent lighter than stainless steel—it's one of the best metals ever developed. Now it's $5 a pound but, if technology is applied energetically against this cost problem, in time we will have titanium at reasonable costs. So the shifting pattern of use will also help. Magnesium is another example of what might take the place of some of these materials that are getting too expensive.

PLASTICS REPLACING METALS

Question. At the same time, plastics replace the metals?

Answer. That's right.

Question. What's the third way?

Answer. The third way is to import more, and we've discussed some of the serious problems we have to solve if we're going to get private investors to risk their money. As an example, to get the copper we estimate was needed—unless some unexpected substitution turns up—we ought to increase copper investments abroad by $2½ billion during the next 25 years—an annual investment rate of $100 million a year.

Question. How are we on technology compared to other countries?

Answer. Of course, European technology suffered as a result of the war. We're ahead in many areas. We made only a brief survey of that situation. Our main inquiry was aimed at finding out whether we had enough technologists to take care of our problems. It was necessarily a quick study—a full look would be a job for another commission—but our quick study showed up an alarming picture.

Question. What was that?

Answer. We just haven't enough technologists. We traced the number that might come out of the colleges by 1956, and the number is wholly inadequate to take care of our needs. Also basic research hasn't been going ahead as fast as our technology. Most of the scientists and technologists had to turn to applied science during the war and afterward, and our basic research shelves haven't been replenished at a fast enough rate.

We called attention to the need of spending more money in this field. The National Science Foundation, which was set up by Congress, as you know, to stimulate activity in this field, has received an appropriation of only about $3½ million although the act authorized $15 million. Vannevar Bush, who earlier made a recommendation for the creation of the Foundation, estimated that $122 million a year was needed.

A later study raised that figure to $250 million. We recommended that the $15 million authorized be appropriated soon. Further, we suggested that Congress reexamine the adequacy of the authorized amount.

Question. That whole operation, both in research and the increase in education, involves more governmental operation, doesn't it?

Answer. Government today spends about 56 percent of the $3 billion devoted to research in this country. And nearly 90 percent of the Government amount is being spent for military purposes. Some of that, of course, will benefit industry. But we found that there wasn't sufficient coordination between Government departments active in the materials-research field. We recommended a much better job of coordination. We also recommended that industry throughout pay much more attention to technology as good businss and as a way of anticipating serious shortages of materials.

Question. Would you favor wiping out all tariffs?

Answer. We came out very strongly in recommending lowering tariffs on raw materials under the reciprocal trade agreements, at least in asking Congress to pass legislation permitting them to be lowered on materials that we are importing in great quantities. We also recommended legislation to authorize the elimination of tariffs altogether in situations where the materials which we are importing are crucial, and if necessary to do this unilaterally outside of the reciprocal trade agreements.

AVOIDING A PRICE SQUEEZE

Question. Aren't you afraid that if we begin to grow dependent on these foreign sources, those countries, knowing that we are so dependent, will increase the price and hold us up? What is your protection there?

Answer. If import conditions become unfavorable we can always find other solutions by getting more from our domestic supply, devising substitutes or, if we have to, using less.

Question. Doesn't it take time to develop domestic supplies?

Answer. Yes, but imports aren't cut off overnight. There are always warning signals which tell you ahead of time.

Question. Also, aren't you protected in the sense that there are sources of materials in various countries and no one country has a monopoly on any one material? Is there a country that has a monopoly?

Answer. Until we developed synthetic rubber, southeast Asia had almost a monopoly on rubber. We have got around that through the use of technology.

Question. Is that a good example of how we can protect ourselves?

Answer. It is one way. Also if world prices rise our mines at home find it profitable to produce from lower-grade ores, and they come into competition. Take the case of manganese. If the price were a little more than doubled we have reason to think that the United States could produce almost all it needed from low-grade ores. Even at prices a little above world markets, more of our manganese would be profitable to mine. That isn't a good solution economically, but it's the sort of thing that puts a ceiling on the prices people can charge us.

In the case of rubber, technology came through. It took a lot of Government money and the pressure of war needs to bring it off. We think it would be dangerous just to depend on technology to meet all such situations.

ROLE OF SYNTHETIC RUBBER

Question. You would favor, for example, keeping our standby operations on synthetic rubber, wouldn't you?

Answer. Oh, absolutely. Even that won't be enough for our needs 25 years from now, of course. As we see it, our needs for rubber will probably double, and the needs of other free countries will probably triple. The free world now turns out about 2 million tons of natural and synthetic rubber a year, of which the United States manufactures about half—and uses about half. But with a possible demand for 5 million tons of new rubber in 1975—with the United States using about half of it—synthetic production would have to expand a lot to keep pace.

Question. Supposing that in time of war we have difficulty in getting access to the parts of the world that have raw materials. Does that bring into play the question of what kind of Navy you will have to protect the lines of communications?

Answer. Yes, but it's a much broader problem than protecting shipping lanes. If we are to have security in materials we have to have enough materials to support us in a hot war on the basis of many foreign imports being cut off. In certain cases, we will take care of ourselves through stockpiling; in other cases, we will subsidize a domestic industry so as to keep a core that can be expanded if war comes; and in still other cases we can take care of it by developing resources in safe areas outside of the country—areas which we can depend upon and from which transportation lanes can be kept open without too much difficulty.

We have to apply the low-cost principle to security, too, and choose that method, or combination of methods, that will give us the most security for the lowest cost.

Question. Isn't it also necessary to have a very effective antisubmarine Navy to prevent interruptions?

Answer. The stronger the military defense is against shipping interruptions, of course, the safer we are. During the last war we depended upon the Caribbean area for our bauxite, and I'm told that during the first 7 months we lost about 22 percent of our shipping. It became a very serious situation. The Defense Department, I'm sure, has taken this question into consideration in a real way.

Question. To what extent did you find that cartels controlled distribution and price of raw materials?

Answer. We came out very strongly against supporting any cartel arrangement. We think they are bad for our economy as well as for the economy of the rest of the world.

Question. If you could bring about stabilization in raw-material prices in the world, you would do it?

Answer. When you bring in stabilization you get into economic controls, which we do not favor, except where security is paramount.

Question. Nevertheless, don't your policies make it necessary to give Government agencies more flexibility in meeting material problems as they come up? You want to give them authority, for example, to make long-term contracts?

Answer. Yes, but only, as I have said, if security demands it. We encourage the Government to take actions aimed at creating situations favorable to private foreign-resources development. For instance, in cases where private capital wants to go into a certain country but is afraid to because of the fear of expropriation, the fear of the imposition of export taxes and the inability to convert currency—the things which bother businessmen in going to a foreign country—we urge the United States Government to consider a bilateral treaty with that country which would give private risk capital protection against such uncertainties.

AIDING INVESTMENT ABROAD

Question. Isn't that a great long-range problem—getting private capital to flow into a foreign country?

Answer. Right. And we tried to recommend those things which we thought would create a better investment climate for the long run.

Question. Do you envisage any international pool to allocate raw materials if they become scarce?

Answer. We think there is a necessity for it only in an emergency period.

Question. Do you think we have an emergency today?

Answer. I'm not sure whether emergency conditions today warrant a continuation of international pools. In a tight emergency situation, sharing would be an effective method of building the greatest common strength. But instead of planning to "share shortages" all the nations of the free world must put their emphasis on expanding supply to feed expanding demand. If we all keep pushing resource development we won't have to worry about allocations, except in special emergencies.

Question. Did your Commission come up with an idea for superstockpiles—broader stockpiles so that Government would try to stockpile enough aluminum or iron ore, for example, to take care of the civilian economy in time of war, as well as taking care of the military?

Answer. We recommended that stockpiling be a permanent policy and that we catch up with our stockpile goals as quickly as feasible; also that we administer our stockpiling operation more efficiently in the future; further, that we should not release stockpile materials to take care of our economic needs except under emergency conditions. But it's my understanding that when you release material from the stockpile in wartime, it goes into the general market to be taken up according to priorities or allocations. If that's correct, our stockpile has always included materials for essential civilian use in wartime—those that would have priorities or that would receive allocations.

Question. You wouldn't favor going into a stockpile after there has been a very serious strike and depend upon the stockpile to bail us out?

Answer. No. We consider stockpiling a wartime and security mechanism. We don't see it as a stabilizer of our economy. We do think, however, that in purchasing for our stockpile we have to take economic factors into consideration so as not to affect the economy adversely.

STRESS ON EFFICIENT USE

Question. Did you go into the efficient use of materials?

Answer. Yes, our report emphasizes that we have to think more about greater efficiency in the use of materials. We have always thought of ourselves as having a great plenty of everything at low costs. That just isn't true any longer, and industry and Government are going to have to put their minds to the task of doing more with less.

There is particular need for attention to this problem by the Department of Defense. We have the feeling that the attitude of the military so far has always been that they can have what they want and as much as they want. We recommended that they pay more attention to the supply side of things, particularly when they can identify impending shortages. We contend that in an economy like ours there is a point where, if the military presses too hard against the civilian economy, the civilian economy cracks, and if it does, and we are in a war, then we lose the war.

We recommended that the Secretary of Defense submit an annual report on what the various departments have done by way of actions toward conserving raw materials.

And another point: One of the hot questions, of course, is whether depletion allowance is a sound incentive for minerals exploration. We could find no better alternative.

Question. Did you discover any comparison in alternatives or incentives as to which would provide oil more quickly and more reasonably—State ownership of tidelands oil or continued Federal ownership?

Answer. No. We were very concerned, however, about meeting the tremendous increase in the demand for oil in case we get into a hot war, particularly if Middle East oil is cut off. If Western Europe isn't supplied from the Middle East, the drain on the Western Hemisphere will be increased enormously.

Question. How does that touch the tidelands oil controversy in this country?

Answer. We found that we should take security measures so that during a hot-war period we could increase our production of oil very rapidly. During the last war we tried by the so-called wildcatting method, which is, of course, less productive than drilling in fields which have been proven. Toward developing a situation where we might have proven fields to be turned to, we suggested that the offshore oil, whether under Federal or State jurisdiction, should be developed on a basis of much wider spacing than usual and of withdrawal allowances less than usual, so that in the case of a hot war we would know where we could get larger production. In a sense we would have an "underground stockpile" of oil.

Question. Did you look into the level of taxes?

Answer. We studied the tax situation as it affected the supply of materials and made recomendations bearing on both domestic and foreign-resource development.

Question. Are there any phases that we haven't covered?

Answer. I think our recommendations on the building industry are vital. The industry is the largest single user of materials in the United States.

FOR NATIONAL BUILDING STANDARDS

Question. You recommended antitrust action and setting up national building standards to do away with obsolete and excessive requirements for materials under codes?

Answer. Yes, and that the Federal Government follow those standards itself, and give help to private building—such as FHA mortgage insurance—only when those standards are observed. It would save materials. It could cut costs.

In closing, I'd like to emphasize one point again: The materials problem is not a problem of absolute shortages. We aren't likely really to run out of anything. It is basically that we are growing so fast and using so much—probably 4 billion tons of material a year by 1975—that there aren't adequate supplies at home to meet our needs at low costs. The result, and the danger, is that we'll have to put so much effort, so much time and money into getting what we need that our costs will go up all across the board. That could slow down our growth. It could cut into our standard of living. It could weaken our military strength. It's not a crisis, not an emergency. But it could become both if we don't pay attention now to the warning signals and do what has to be done promptly to increase our supplies at home and abroad.

[From Pay Dirt, a publication devoted to the interests of the Arizona small mine operators, August 22, 1952]

"RESOURCES FOR FREEDOM"

PALEY COMMISSION'S REPORT GIVES LONG-RANGE APPRAISAL OF MINERAL RESOURCES—RECOMMENDATIONS ARE MADE FOR PRODUCTION AND FOR CONSERVATION

By 1975, the demand for minerals in the United States will have increased about 90 percent, according to the President's Materials Policy Commission. The forecast was contained in a 5-volume, 800-page report, Resources for Freedom, in which the Commission attempted to blueprint the long-range minerals and metals outlook and to outline policies designed to assure adequate mineral raw material for the United States economy.

The group, better known as the Paley Commission, was guided in making its comprehensive report by a large staff of its own, and by experts from all Government agencies which are concerned with mineral and metal production. In

addition, some 45 private individuals took part in conferences and meetings at which the various angles and aspects of the problems were discussed. The consultants included many who were not actually engaged in mining, but were in affiliated or related lines.

Among the mining men serving as consultants were: Horace M. Albright, president, United States Potash Co.; Dr. A. M. Gaudin, Massachusetts Institute of Technology; Ira B. Joralemon, consulting mining engineer; Evan Just, editor, Engineering and Mining Journal; Arthur Notman, consulting mining engineer; Robert C. Page, president, Phelps Dodge Corp.; Dr. Philip J. Shenon, University of Utah; Dr. John W. Vanderwilt, president, Colorado School of Mines; Samuel J. Williston, vice president, Cordero Mining Co.; and Howard I. Young, president, American Zinc, Lead & Smelting Co. Others represented the oil interests, forest-product users, metallurgical research groups, and foreign interests.

The Paley report examines the long-range outlook for production of metals, minerals and other raw materials, not only in the United States but throughout the world. At the outset it states that the country must look to private industry primarily as the vehicle for solving the raw materials problem. However, many of the recommendations call for active participation by the Federal Government in both the domestic and foreign minerals field.

The study assessed American materials needs and supplies over the next 25 years and found that the Nation had already crossed the great industrial divide into the status of a raw materials deficit nation. It predicted that by 1975 the United States will be importing about one-fifth of its entire industrial needs, at a cost of about $3 billion.

Absolute shortages are not the big threat, it says. What really concerns the Commission is insidiously rising costs which can undermine our rising standard of living, impair the dynamic quality of American capitalism, and weaken the economic foundations of Nation security. These costs are not just dollar costs, but what economists refer to as real costs—meaning the hours of human work and the amounts of capital required to bring a pound of industrial material or a unit of energy into useful form. The challenge, it pointed out, is to meet expanding demands with expanding supplies while averting a rise in real costs per unit.

In projecting future demand, the report estimated that United States mineral consumption will grow by the following percentages within 25 years: antimony, 81; bauxite, 291; beryllium, 250; cadmium, 250; chromium, 100; cobalt, 340; copper, 43; fluorspar, 300; iron ore, 54; lead, 53; manganese, 60; magnesium, 1,845; molybdenum, 170; nickel, 100; sulfur, 100; tungsten, 150; and zinc, 39.

RECOMMENDATION

More than 70 recommendations were advanced by the Commission, ranging from the elimination of laws that retard other countries from selling materials to the United States, to financial aid and incentives to exploration and development of undiscovered resources, both at home and abroad. The principle of a high protective tariff for American industry was called obsolete, and the Buy-American Act a relic of depression psychology.

So that the United States may improve its domestic materials position in mineral resources, the Commission recommended that:

(1) A complete census of the minerals industry be taken by the Bureau of Census every 5 years and that methods of gathering and analyzing mineral statistics be improved;

(2) the United States Geological Survey speed up geological mapping of the United States and Alaska;

(3) Intensified programs for research to improve exploration methods be initiated by the Government, acting with private industry and universities, but only where private industry cannot be expected to undertake such programs;

(4) The alternative of leasing be made available for all Federally owned mineral deposits to which only the location system now applies, the individual prospector to determine which system he wishes to use, and that reforms be made in present mining laws governing the location system;

(5) Percentage depletion be maintained as a tax incentive without further increases in rates and that present limitations on the amount of permitted expensing of exploration costs on minerals be removed;

(6) Legislation be enacted to give financial assistance—up to $100,000 to an applicant—to small-mining operations to support prospecting for new deposits of strategic minerals; the advances to be in the order of $15 million over 5 years; and

(7) Stockpiling of strategic and critical materials be made a permanent policy, with full consideration given to the vulnerability to enemy attack of the United States and Western Hemisphere production facilities.

PERCENTAGE DEPLETION

Regarding the Federal income-tax law, the Commission stated that percentage depletion and expensing of certain costs of exploration, discovery, and development provide special incentives for mineral production. It therefore recommended that percentage depletion be retained at the present level, but not raised; and that Congress reconsider the additions made to the percentage depletion list by the Revenue Act of 1951 so that the device would be confined to those minerals for which the hazards of exploration are great, a principle that apparently did not govern the selection in the 1951 list.

TAXATION

With reference to State and local taxes, the Commission said that ad valorem taxes have an adverse effect on the extension of mineral reserves by private companies. It suggested that "whenever State or local governments can substitute severance taxes, or taxes on gross or net proceeds for ad valorem taxes on mineral reserves, they will make a contribution toward improving the Nation's mineral position."

MINING LAWS

The report stated members of the Commission had questioned industry and Government officials as to whether the mining laws should be modernized, and had found that the present laws cause many difficulties for industry and Government alike. It pointed out also that members of the mining industry would prefer to leave the present laws as they are to prevent changes that might open the door to excessive Government interference, but took the position that the risks of making a change are much smaller than the risks of standing pat.

Its study resulted in the conclusion that for mineral deposits with no surface manifestations a concession-leasing system will produce a higher rate of discovery; and that for deposits discoverable by surface outcroppings, an amended claim system can be a strong stimulus.

The following recommendations were made with respect to the present mining laws:

(1) That legislation be enacted making the alternative of leasing available for all federally owned mineral deposits to which only the system of appropriation by claims and patents is now applicable, i. e., all mineral deposits now subject to disposition under the mining laws. The determination of which system should apply in individual cases should be left to the initiative and preference of private prospectors.

(2) That, in general, only tracts with respect to which exploration permits or leases have been granted (and hence a decision made on private initiative to proceed via leasing rather than appropriation) should be closed to general prospecting and the establishment of claims. For the guidance of prospectors, tracts leased or under permit or otherwise closed to appropriation by claims, should be marked and recorded.

(3) That the leasing system (as an alternative for mineral lands to which only the system of appropriation is now applicable) should include the following features:

(a) Provision for granting exclusive prospecting permits of reasonable duration, terminable for failure to carry out a prescribed measure of exploration activity.

(b) Unless previous commitments prevent it, prospecting permits for whatever size tract the applicant requests, up to a prescribed maximum. The maximum should be large enough to permit use of advanced exploration techniques.

(c) A prospecting permit carrying with it a preferential right, in the case of discovery, to lease an agreed part of the area on terms and conditions established before exploration is begun and not subject to changes disadvantageous to the lessee.

(d) Only nominal royalties on leases granted under discoverers' preferential rights, so as to provide an incentive to exploration. Leases for tracts on which deposits already are proved or partially proved should, so far as practicable, be awarded by competitive bidding.

(e) Option for any prospector who has made a discovery sufficient to support the establishment of a mining claim to take a lease at nominal royalties in lieu of a claim, and for any holder of an existing valid claim to surrender his claim in return for such a lease.

(4) That the system of appropriation by claims and patents should be modified to include the following features:

(a) All nonpatented claims, adequately described, should be recorded in the Department of the Interior and that Department should prepare and make available accurate plats for the guidance of prospectors. Failure to record an existing claim within 3 years of enactment of the amendment should constitute abandonment. New claims should be deemed invalid until recorded.

(b) Future claims and patents should be limited to the mineral deposits thereon and to only such surface rights as are needed for mining purposes.

(c) No extralateral rights should be acquired with future claims and patents.

(d) The annual requirements for improvement of unpatented claims should be increased to $250. A 3-year carryover for any excess should be permitted, as should the crediting of any excess spent on one of a group of contiguous claims to any of the others.

(e) The improvement requirement for granting a patent should be increased to $1,250.

(f) In addition to its present authority to invalidate claims on the ground that there has been no discovery, the Department of the Interior should be authorized to invalidate claims upon a showing (1) that the deposits discovered are insufficient to justify further development of the claim as a mining property, or (2) that assessment requirements have not been met.

(g) If within 10 years after a claim is established, no application to patent it is made, the claim should become invalid automatically.

INCENTIVES

The Paley report gave considerable attention to financial incentives by Government as a means of bringing forth greater supplies of minerals. Resort to special incentives, it declared, is "a recognition that price relationships generated by the free play of market forces will not bring about as prompt and as large an increase in production of certain materials as the Nation needs," and that the incentive plan seems particularly adapted to the mineral industries.

Concerning the principal incentive devices used, it said:

(1) Devices other than tariff protection should be used.

(2) Long-term contracts and standing purchase offers for domestic production are well suited for use with certain minerals which are either chronically scarce or expected to be so during the period of the contract, but should be used only where a substantial amount of needed domestic production or productive capacity is not otherwise obtainable at lower cost.

(3) Loan guaranties have had relatively little use.

(4) Loans for development and extension of facilities have been undertaken, but have been the decisive factor in undertaking a particular project in relatively few instances.

(5) Government credit is needed in developmnt of marginal deposits and exploration by small-scale prospectors.

(6) Premium-price plans are useful under special emergency circumstances, but the commission regarded them as ill-fitted for use as part of a long-range price policy.

BUFFER STOCKS

The Commission was outspoken in its conviction that the solutions to the problem of materials market stability must be sought through international agreements in which the United States will have to take a leading part. Suggested arrangements included multilateral contracts, international buffer stocks, and international buffer stocks combined with limited quota arrangements. International buffer stocks without quota provisions should be considered for materials such as copper, lead, and zinc, which are easily storable and are expected to remain scarce, it said.

CONSERVATION

In the opinion of the Commission, the United States faces a very real and growing conservation problem, and many difficulties arise from a failure to recognize the economic dimensions of the problem. It is a popular fallacy, the

report stated, to regard our resource base as a fixed inventory which, when used up, will leave society with no means of survival. The report continued by saying:

"Conservation is something very different from simply leaving oil in the ground or trees in the forest on the theory that by sacrificing lower value uses today we will leave something for the higher value uses of tomorrow when supplies will be scarcer. Using resources today is an essential part of making our economy grow materials which become embodied in today's capital goods, for example, are put to work and help to make tomorrow's production higher. Hoarding resources in the expectation of more important uses later involves a sacrifice that may never be recouped; technological changes and new resource discoveries may alter a situation completely. It may not be wise to refrain from using zinc today if our grandchildren will not know what to do with it tomorrow. But following a course of conservation which, as here suggested, weighs economic factors carefully is very different from the eat, drink, and be merry philosophy which sees no point in judicious self-restraint and no cause to worry over posterity's welfare."

LOOSE DIRT FROM THE BIG STOPE, WHERE THERE'S HIGH-GRADE MIXED WITH A LOT OF WASTE

STATUS OF MINERAL PROGRAMS ANALYZED

Before long the mining industry may expect to hear the details of a new copper program which is being talked over by DPA and DMPA. The present program, which is running out, has worked better than most of the others. It has kept a number of mines open which would have shut down and has made possible potential production 4 or 5 years from now. However, it has not stimulated the opening of the smaller mines which have copper that can be produced now.

There is no lead program outside of the purchase of a few thousand tons as cheaply as possible.

There is no zinc program, and a large part of the industry is on the verge of shutting down. These shutdowns will affect the lead situation also.

The antimony business is shot, as is shown by the shutdown of our only major producer, the Bradley property at Stibnite, Idaho.

An asbestos program is in the making in DPA.

The tungsten program, as far as the bulk of potential domestic operators is concerned, is a flop. The reasons for this have often been pointed out in Pay Dirt. The Government also knows why, but feels it can get its requirements from a handful of large operators and from imports.

Recently DPA announced an increase in its requirement figures for tungsten amounting to 25 million pounds. Accelerated amortization and "other Government aids" will be given to operators who increase production.

What the domestic tungsten producers really need is a better price or more refining capacity strategically located which will operate at lower costs, or both. Unless such action is taken the additional requirement will be supplied mainly from abroad. A few months ago we were supposed to have tungsten running out of our ears.

The domestic manganese program has only produced a relatively few thousand tons of our requirements. The purchase depots are said to be almost idle. A small-lot program at a price which seems high when compared with the market has recently been announced, but the mechanics of the program are so complicated that it is doubtful if it will be effective in creating important additional production.

The chrome program has resulted in the production of a few thousand tons in the Northwest under the stimulation of higher prices. It will be a year or two before the Montana chrome deposits can be put into effective production of a marketable product. Nearly 2 years were lost in Government paperwork before this project was approved, although all the data were available from the last war, as well as a commercial process to utilize the chrome concentrates.

The price of ferro-manganese has been increased by OPS. Ferro-chrome may be expected to follow.

The fluorspar program has materially increased the supply.

The columbite-tantalite program will help production from abroad, but the agencies do not seem to be especially interested in exploring for domestic sources although there is a 90 percent Government participation program on paper.

The mica program, as far as Government purchases are concerned, will not be of much help to domestic producers of strategic mica due to the famous "ruby"

trade specifications. The exploration program, however, is quite active and a good many applications have ben approved, especially in the South.

It is still hard to live long enough to get an application approved by DMPA or RFC. DMEA does much better.

In the meantime, the foreign expansion program proceeds merrily on its way with a minimum of personnel, little friction, many contracts written quickly and efficiently, and a vast outpouring of funds.

WILL CHAIRMAN SMALL USE HIS POWERS?

Although the Munitions Board has the principal planning job for the defense effort, and although the act which authorizes it to do this delegated the top decisions of the Secretary of Defense, no action was taken until recently to redelegate the authority of the Chairman of the Munitions Board. Consequently, although the Chairman had the responsibility, subject only tothe Secretary, actually he had little or no control over the Board.

Now, after years of divided authority, squabbles and wasted effort, the Secretary has delegated to Chairman Jack Small the authority given him by Congress and for the first time he is in a position to make final decisions. This is a big and important step in unifying the defense program. The only question is will Chairman Small dare to use his new powers to overrule the Army and Navy brass hats on the Board?

DMEA AUTHORIZES MERCURY PROJECT

DMEA has gotten around to granting an exploration project for mercury which will result in the expenditure of $243,000. The price of mercury seems to be on the skids along with other metals.

ZINC PRICE DROP MAY CREATE SHORTAGE

With the additional drop in the price of zinc one may expect further shutdowns of zinc mines. And yet DPA has not approved a long-range zinc program. It would not be surprising if by the end of the year we were faced with another tight supply condition in zinc, but much of the damage will have been done before that time, and it is likely many properties would not dare to open again without a long-range, guaranteed price program. The zinc operators are doing some postmortem thinking on how happy they would be had the Murray-Baring mine incentive payment bill been passed 2 years ago and had 3 more years to run.

IS COPPER GOING TO THE STOCKPILE?

Has GSA resumed copper purchases for the national stockpile, and if so, is it foreign copper that is being bought? These question are being asked by members of the copper industry.

In July, Defense Production Administrator Henry H. Fowler issued a statement on copper in which he said in part:

"If United States consumers purchase up to the limit allowed us by IMC, defense programs can be continued unhampered, though only slight increases for civilian copper consumption appear probable in the immediate future. Stockpile deliveries will be revived in the third quarter of 1952."

The words "will be revived" appear to be definite and certain.

Since there is not enough domestic copper to take care of the monthly allocations (only 72,500 tons of domestic copper were allocated for August delivery as compared with 80,000 tons for July), it is taken for granted that if copper is once more being delivered to the stockpile it is not of domestic origin. If it is of foreign origin, then the GSA must be paying the world price of 35.50 cents a pound, f. a. s. Antofagasta. Information concerning stockpile purchases is regarded as "restricted." Therefore, no one can actually tell whether or not GSA is buying copper for the stockpile.

Domestic producers are justified in taking exception to the Government's paying the equivalent of 36.50 cents a pound Valley for foreign copper while their price remains frozen at 24.50 cents a pound.

LABOR CONTRACTS VERSUS COPPER PRICES

For several weeks the copper industry has been negotiating new wage contracts with labor unions without making much progress. The union originally sought

a 25-cent-an-hour wage increase plus a long list of fringe benefits. There has been no change in the union demands, and so far as known no mining firm has presented a counter offer.

If the copper industry is forced to grant a wage increase, it undoubtedly will have to ask for price relief. Domestic copper producers for some time have been dissatisfied with the United States ceiling price—particularly since foreign copper producers have been permitted to sell to American industry at any price they can get. United States consumers are paying 36.5 cents a pound for Chilean copper compared with 24.5 cents that the domestic mines are permitted to charge.

The OPS has permitted brass and wire mills to boost their prices to the extent of 80 percent of the 12 cents more they must pay for foreign copper.

NPA LIFTS COPPER AND ALUMINUM RESTRICTIONS

Early in August the National Production Authority removed almost all restrictions on the use of copper and aluminum for home building, industrial and commercial structures, highways, and communications projects. The action, it was said, was made possible by an increase in aluminum production and by greater imports of copper as a result of the Government's decision to permit higher prices for copper imports. Another factor is the defense program stretchout which has lessened the need for these metals for military purposes.

NPA also has removed restrictions on the use of copper and aluminum for decorative purposes in the manufacture of consumer goods.

These orders wipe out prohibitions which have been in effect for 13 months. However, manufacturers will receive the same amounts of metals they have in the past.

RULING WOULD CIRCUMVENT LAW'S INTENT

How a Government agency can circumvent the will of Congress as written into a law is again illustrated by the recent action of the Bureau of Internal Revenue with respect to the $75,000 exploration deduction.

The Commissioner has ruled that a parent corporation filing a consolidated tax return may determine how the $75,000 mine exploration deduction is to be divided among its subsidiary companies, provided that the total deductions so allowable to all members of a consolidated group shall not exceed $75,000.

The law states that this deduction may be taken by any taxpayer, and mining interests had urged that each subsidiary company be allowed a separate $75,000 deduction for mine exploration expenditures. They term the Bureau's regulation a clear breach of congressional intent and another fraud against the mining industry.

HOUSE APPROVAL GIVEN LEASING PROPOSAL

Before adjournment, the House passed the Regan bill which would take sand, stone, gravel, pumice, pumite, and cinders from under the mining laws and subject them to leasing when located in national forests. However, an amendment by Engle of California preserved the right of the miner to locate the ground when minerals other than those named, and which generally are subject to location, are present.

BACKGROUND OF STAFF MEMBERS IS NEEDED

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Sticking out like a sore thumb is the ubiquitous Samuel Lipkowitz of horrendous memory from WPB days. All this leads up to the thought that it would be a little stupid to take the Paley report at its face value until a short background biographical sketch of each of these staff members is made public. One never knows who may have crawled under the tent. As a matter of fact, the only member of the Commission who is publicly well known to the metals industry is Arthur Bunker. And there are many people who think he is not too sound a man for the domestic miner to tie to.

DEVELOPMENT FINANCING IS STUMBLING BLOCK

Difficulties have developed in the attempts to have DMPA finance development work for properties which either have been certified by DEMA as having made an exploration discovery or which already have been sufficiently explored but need to block out ore before they are eligible for production and expansion loans. A glance at the list of minerals and metals eligible for exploration will reveal that not all of them are considered immediately strategic and in short supply by DMPA. Zinc is a notable example, as DMPA has had no zinc program for some time.

According to reports, DMPA does not consider that it has any obligation to follow up DMEA exploration projects, however successful, with the financing necessary to put the mine into operation. Therefore, unless an operator knows where he can get private capital for development work and to prepare the mine for production, he had better look twice at the situation before he hocks his grandmother's gold teeth in order to match funds with DMEA on an exploration program, believing that DMPA or RFC will finance him into production.

TIME ELEMENT IS VITAL FACTOR

The details and regulations on the GSA program for railhead purchases of manganese ores have been published. Two things may defeat the small operator in trying to take advantage of the program. One is the necessity for accurate sampling and assaying before shipment, and the other is the time element involved before payment.

Suppose you mine a carload of manganese which appears to fill the minimum specifications. In some locations it may take 2 weeks to get a complete analysis of the samples. You must then notify General Services Administration 20 days before you wish to ship, sending along your presumed analysis. Within 15 days GSA will inform the shipper of the "receiving point" to which the lot must be delivered at shipper's expense, and the "consignee" to whom the shipment is to be made. Freight conditions being what they are, another 10 days may be required for rail transportation. The lot then must wait its turn to be weighed, sampled, and analyzed at the expense of the Government. Upon receipt of the analysis, the Government will inform the shipper as to the acceptability of the lot. How long these last 2 steps will take is anybody's guess, but 10 days would seem to be a fair estimate. Then it takes time to get a Government check into the mails. Will a small operator be able to meet his payroll for that long a period?

OVERCEILING CONTRACTS ARE PERMITTED

It will be remembered that Senators Hayden, McFarland, and Murray introduced an amendment to the Defense Production Act which would have liberalized the act and clarified it to make sure that overceiling prices could be granted in DMPA contracts, not only for sustaining production but to bring out new production. Senator Maybank, chairman of the Banking and Currency Committee, was asked to make this a committee amendment. When the amendment was not included in the new act, Senator Maybank wrote Senator Hayden as follows:

"While the committee was considering bills to extend the Defense Production Act, you wrote me to urge a clarifying amendment permitting the Government to enter overceiling contracts where necessary in the interest of national defense to procure strategic or critical materials from high-cost sources.

"As you know, Public Law 429 has now become law. While no such amendment expressly appears in the law, in my opinion its omission is not intended to deny the Government the right to make such contracts where deemed necessary, under the broad contract authority previously granted the Government in title III of the Defense Production Act, as amended."

COMMITTEE WILL REPORT ON PALEY REPORT

Now that the Paley Commission's report is being displayed (although mostly unread) on almost every desk, a new committee has been appointed by the National Security Resources Board to read it and write a report on it.

One of the most interesting things about this announcement was the evidence it gave that the NSRB is still with us and that one Jack Gorrie is chairman thereof. It is amazing how these boards maintain just enough vitality to survive and let out an occasional moan or groan in the form of a press release to let us know they are around.

As set up by law, NSRB originally had the concentrated war powers of the Government in its hands. Most of them were never used and its position weakened bit by bit until, like most semidefunct agencies, it finally wen to Steelman, then quietly faded away to its present background position, occupying valuable space in the Executive offices and apparently accomplished little. Now, in one of its dying gyrations, it has produced a committee to study the report of a commission which reported on hypothetical economic conditions in the raw materials business in 1975.

THE PALEY REPORT—NATIONAL POLICY?

(By John E. Kelly, Washington, D. C.)

With the publication of Resources for Freedom, the 800-page report of the President's Materials Policy Commission (Paley Report), the have-not question rises to the level of national policy. It is 7 years since Elmer Pehrson of the Bureau of Mines launched his trial balloon unofficially under the title of "The Mineral Position of the United States and the Outlook for the Future." That pessimistic view, indicatively subtitled "Decreasing Self-Sufficiency Seen in Postwar Years," found America's reserves ample only in air, water, magnesium, nitrogen, coal, and fertilizer materials. An accompanying chart of commercial reserves, 1944, gave domestic quicksilver mining 3 years of life, American manganese, 2 years. Twice and thrice the forecast expectancy has been exceeded and quicksilver and manganese resources remain substantial today. The have-not propaganda has been vigorously combated and tattered by physical disproof, but with a transfusion of Federal funds it undergoes a sea change and emerges in striped pants and top hat as the Paley report.

While the Commission gives lipservice to domestic mining its heart is with overseas minerals to be imported in everincreasing quantities. As the creature of an internationalist administration, dedicated to sowing the free world with the taxpayer's hard-won dollars, the Commission's internationalist predilection is not surprising. The theme is set forth: "There is no such thing as a purely domestic policy toward materials which all the world must have; there are only world policies that have domestic aspects." Only 1 of the 5 members of the Commission is a mining man, although a second is engaged in natural-gas pipelining. The Chairman is an entertainment executive, joined by a magazine editor, and a Harvard professor, all three easterners.

While the report advocates continued exploration and mapping of domestic mineralized areas, it leans to the too-easy conclusion that the bonanzas and great ore bodies have been found, that little may be expected but gleaning and salvage. Such snap judgment, long a mainstay of the have-nots was authoritatively controverted by Charles H. Dunning, who pointed out that all of Arizona's great production has come from 3 percent of its area. The 97 percent covered by sediments or volcanic flows of varying thickness cannot, in this day of scientific depth tests and deep mining, be all written off as barren and inaccessible. Ira B. Joralemon has stated the case for domestic exploration in classic terms "* * * when it is worthwhile (i. e., profitable) to hunt for ore bodies of metals that have been produced in great quantities in the United States, the search will bring important results * * *." Exploration is direcly linked to economics, the business of making a living. If American miners are treated as well as the administration's foreign beneficiaries, if they are not held to a 24-cent price for copper while Chileans receive 36 cents, the Commission would behold a rash of new finds and development.

In what is obviously intended as an assistance to the small miner, the Commission advocates replacement of the tried and true mineral claim, by which the miner has title to his operations, by the Ickes scheme of leasing, reducing the miner to the unstable status of a tenant at will of Uncle Sam, a tenant moreover who cannot sue his landlord. This is but one of numerous instances in which the lack of experience of the Commissioners is apparent. The Commissioners are men of good will. They are not hostile to domestic mining, but inclined to accept uncritically the argument of the have-nots. Neighbors' fields are proverbially greener, and seen through the haze of 5,000 miles, run-of-the-mill foreign mineral deposits glitter like King Solomon's mines.

No one opposes the development of foreign mineral sources—as supplementary to domestic ore in bulwarking the national economy and defense effort. But warning headlines appear in the daily press against placing major reliance upon

imported ores. Nationalism strides the world, bringing confiscation of privately owned properties, or confiscatory taxation. High as American taxes are, 50 percent royalties (the prevailing trend abroad) are high in any language, while nationalization (confiscation in plain words) leads to abandonment or control by Red Russia. Much as Washington may wince from the hard fact, no unqualified reliance can be placed upon continuity of supply from any overseas mine not under the American flag.

Consideration of the insecurity of investments abroad, coupled with the growing appetite of the American industrial machine, should reinforce the domestic mining case in every phase. A billion dollars invested in "uncertainia's" mines must be weighed in the light of increasing hatred of foreigners and political instability leading to paralysis of operations or loss of the properties. What revolution-free results would be obtained from investing the billion in deep drilling, drainage tunnels, access roads to districts as well as to individual mines, communal shafts, custom mills and smelters, research and geophysical exploration at home?

The tables appended to the Paley report are of reference use. The controversial text will serve mining men as verbal dynamite for years. Had the main effort of the Commission been directed toward building up the domestic industry, cutting the throttling bureaucratic redtape, instead of blueprinting easy ways to spend money abroad, the five volumes would deserve a place on the shelf beside Dana, Lindgren, and the handbooks. If the report's recommendations be carried out, the domestic miner will be taxed even more heavily to develop his foreign competitor. The specifications fill 800 pages; the miner's bill is almost as lengthy. It comes in a companion volume called the Internal Revenue Code.

[From Mining World, September 1952]

Capitol Concentrates—Is GSA Now Buying Foreign-Mined Copper for Stockpile?

Has GSA resumed copper purchases for the national stockpile, and if so, is it foreign copper that is being bought? These questions are being asked by members of the copper industry.

In July, Defense Production Administrator Henry H. Fowler issued a statement on copper in which he said in part:

"If United States consumers purchase up to the limit allowed us by International Materials Conference, defense programs can be continued unhampered, though only slight increases for civilian copper consumption appear probable in the immediate future. Stockpile deliveries will be revived in the third quarter of 1952."

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RULING WOULD CIRCUMVENT LAW'S INTENT

How a Government agency can circumvent the will of Congress as written into a law is again illustrated by the proposed action of the Bureau of Internal Revenue with respect to the $75,000 exploration deduction. The law states that this deduction may be taken by any taxpayer. It is understood the bureau may rule that if a company has several corporate subsidiaries only $75,000 in total may be deducted for all. This is a clear breach of congressional intent and another fraud against the mining industry.

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Difficulties have developed in the attempts to have DMPA finance development work for properties which either have been certified by DMEA as having made an exploration discovery or which already have been sufficiently explored but need to block out ore before they are eligible for production and expansion loans. A glance at the list of minerals and metals eligible for exploration will reveal that not all of them are considered immediately strategic and in short supply by DMPA. Zinc is a notable example, as DMPA has had no zinc program for some time.

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to study the report of a commission which reported on hypothetical economic conditions in the raw-materials business in 1975.

ZINC PROGRAM STILL MISSING

To date no sign that a new zinc program will be approved has been seen in or about Washington. A great many applications for floor prices, purchase contracts and loans are held up indefinitely in DMPA. If there is to be no new program it would be kinder to so notify those who are already on the hook and who have spent valuable money and time preparing applications (not to speak of the Government's cost in processing them), and to tell the mining public not to waste its time filing additional applications.

TIME ELEMENT IS VITAL FACTOR

The details and regulations on the General Services Administration program for railhead purchases of manganese ores have been published. Two things may defeat the small operator in trying to take advantage of the program. One is the necessity for accurate sampling and assaying before shipment, and the other is the time element involved before payment.

Suppose you mine a carload of manganese which appears to fill the minimum specifications. In some locations it may take 2 weeks to get a complete analysis of the samples. You must then notify GSA 20 days before you wish to ship, sending along your presumed analysis. Within 15 days GSA will inform the shipper of the receiving point to which the lot must be delivered at shipper's expense, and the consignee to whom the shipment is to be made. Freight conditions being what they are, another 10 days may be required for rail transportation. The lot then must wait its turn to be weighed, sampled, and analyzed at the expense of the Government. Upon receipt of the analysis, the Government will inform the shipper as to the acceptability of the lot. How long these last two steps will take is anybody's guess, but 10 days would seem to be a fair estimate. Then it takes time to get a Government check into the mails. Will a small operator be able to meet his payroll for that long a period?

ANOTHER OVERCEILING COPPER CONTRACT

DMPA Administrator Jess Larson has announced another overceiling contract covering production of nearly 9 million pounds of electrolytically refined copper from ores that cannot be mined economically under present ceiling prices and under present wage scales and other rising costs. The contract calls for a year's assisted operation of the Howe Sound Co.'s Holden mine in Chelan County, Wash.

The new agreement is the sixth of its kind thus far negotiated by DMPA, and is in line with Larson's policy statement of last December in which he announced that, where necessary, the Government would grant overceiling subsidies in order to assure continued supply of needed copper. All such subsidy agreements may be canceled by either party on 60 days' written notice and terminate automatically in the event price ceilings on copper are removed by the Government.

If you are to judge by the action—or lack of it—the policy seems to be aimed only toward the maintenance of present production rather than any effort to get increased production by means of overceiling contracts.

[From Mining World, September 1952]

MINING INDUSTRY SPOKESMEN GIVE THEIR VIEWS ON "PALEY REPORT"

(The report of the President's Materials Policy Commission, Resources for Freedom, has now been popularly termed the Paley report. The August issue of Mining World gave the highlights of the report's findings and forecasts, and the mineral recommendations. It is not surprising that leaders in the domestic mining industry have studied the report with great interest. Industry spokesmen herewith present their views of the report and its recommendations.—Editor.)

John E. Kelly, consultant in natural resources, Washington 5, D. C., reports that: A strong domestic mining industry is essential to national security. It is regrettable that in its recent report Resources for Freedom, the President's Materials Policy Commission did not keep that axiom continuously in mind.

Had it done so, its eight-hundred-odd pages of findings and conclusions would have been less vulnerable to criticism, more useful as a guide to the Nation's future mineral policy.

The Commission appears to have been influenced in part by two fallacies widespread in recent years. Internationalism is currently in vogue, along with the outpouring of billions of United States taxpayers' money to finance schemes and prospects, as long as they are foreign. "Patriotism" has become almost a smear word; enterprises like domestic mining are hogtied with redtape, controls, and restrictions, while know-how, machinery, and money are lavished upon overseas mines. Tariffs are abolished or suspended on mineral imports—and then the stockpilers pay the foreign mines prices in excess of domestic price ceilings. United States miners seeking to develop and market mercury, manganese, and other ores found themselves confronted by an iron curtain of official policy, covertly or openly favoring their foreign competitors. To drum up voters' support of the export of Government funds, "have not" propaganda is bellowed from Federal rostrums.

RISKY RELIANCE ON FOREIGN MINES

We are told with increasing frequency by both congressional and defense authorities that, incredible as it may seem, the United States is losing the armament race to our Russian antagonists. It has been officially disclosed that the Reds possess exceeding 300 new submarines, designed by German scientists with the most modern devices, and embodying advanced propulsive and detonating mechanisms. This is a number stated to surpass the combined total of submarines of equal striking power possessed by the free nations which, moreover, must deploy their vessels widely in defense of trade routes and ports while the enemy, integrated on his immense land mass, may concentrate his efforts on attack. What profits national defense from foreign mines, of clear title and pure metal though they be, if the seas between are held by a hostile power? In World War II, when the German possessed a much inferior submarine force to the reported present Soviet fleet, over 80 ore carriers were sunk in the Caribbean alone, at our very door. The new mineral picture, as presented by the Paley Commission, shows vital defense supplies drawn from India, Africa, Indonesia, the Far East, and Oceania, as well as South American exports deliverable only by ocean transport. It seems, therefore, risky in the extreme to place our main reliance upon foreign mines.

Proponents of favor to foreign mines attempt to parapet themselves behind the argument of the stockpile. We are not at war—yet—they say, and have time to assemble sufficient supplies from the overseas deposits so that if enemy action cuts the sealanes, our essential industry can maintain operations. The trouble with this argument is that no stockpile has ever proven large enough for the needs of an embattled nation. The Germans, masters of detail and pioneers in synthetics, amassed stockpiles for years in advance of World Wars I and II, calculated sufficient to outlast any conflict. The principal cause of their defeats was exhaustion of imported raw minerals. In our own history, the besieged Confederate States were starved of material necessities by the blockading Federal fleet.

If we are not yet in a state of war, neither are the great majority of the potential overseas mineral beneficiaries of the Paley Commission's recommendations in production. Many of them, and quite naturally, are deposits of such intrinsic obstacles (excessive overburden, complex metallurgy, climate, great distance from existing routes of communication, etc.) that private capital declined their exploitation. Even with budgets and schedules disregarded, to bring such properties into production may require from 4 to 10 years, an eternity in these days of sneak attack and lightning war.

NATIONALISM SPREADS

Nor are the hindrances to foreign supply of America's mineral needs limited to time and physical obstacles. The rising spirit of nationalism threatens to cut off shipments from an increasing area of the world—outside of the Soviet bloc. Foreign petroleum companies have been ejected from Iran, involving a loss of hundreds of millions of dollars in plant and the largest non-United States production. The lethally successful coup tempts other authorities along the Persian Gulf to emulation.

The evil example spreads. A west African republic that signed a contract in 1949 under which a United States company is constructing a railway and ex-

porting iron ore, now presents astronomical demands: 50 percent of the profits, sales at the world price instead of by royalty as contracted, shareholder and director representation. There is no limit to such acquisitiveness. Grant today's demands, and native nationalism will return tomorrow for a 75-, 90-percent share, confident that its nuisance value in the United Nations Assembly gags effectual United States protest. The visible end of such tendency is nationalization of the mines, socialistic management leading to abandonment, loss of Uncle Sam's investment.

Precedent for such action exists even in the New World. The new government of perennially revolution-torn Bolivia proposes to seize the tin mines, whose production, vital to United States industry, is largely financed by American shareholders.

If realistically administered, foreign ore purchases for stockpile purposes are desirable—as a supplement to domestic production. But with their absolute uncertainty of continuity of supply, as mentioned above, they cannot replace our domestic industry as the principal mineral bulwark of national defense.

"HAVE NOT" HALF TRUTHS

The "have not" argument rests upon half truths. The reading public learns that we "have only 2 years' supply of manganese, 3 years at best of mercury," etc., and is panicked into supporting overseas ventures while writing off domestic mines as empty holes useful merely for raising mushrooms or storing documents against atomic raids. Rarely does the average layman understand, and the "have not" propagandists scarcely emphasize, that their chilling figures represent only developed ore, ready for blasting and shipment to the mill. It would be an extravagant management that would develop ore many years ahead of production, though the mine might possess a century of operating expectancy. Premature development expense could cut heavily into net earnings. Even more important, developed ore becomes taxable, while yet in place in the mine, though it adds nothing to profits.

The fallacy of these dwindling reserve figures becomes clear when, as has repeatedly occurred, the "have not" tonnage is mined and the mines continue in full operation.

The "have not" measure would produce scarce headlines of imminent starvation in New York, for the metropolis rarely possesses food supplies in excess of 24 hours' consumption. Figures for developed ore should be treated as an inventory item, whereupon they will be seen in their true perspective as normal and satisfactory.

Equivalent conditions prevail over huge areas of the West and the Appalachians. The next frontier for domestic mining, paced by petroleum and sulfur exploration, is downward to tap the deep deposits.

Incentive is required for production, in mining as well as in other industry. There was little stimulus to develop domestic manganese deposits and beneficiation methods in the face of official preference for foreign sources. There is small spur to open new domestic copper properties when alien mines, with much lower costs, are paid higher prices by the stockpilers. Thorium was known in North Carolina since the 1890's, uranium in the Colorado Plateu, zircon in the Florida beaches, for many years, but lacking markets, incentive to prospect and develop did not exist. Show the miner a fair market and he needs no Government favor.

DOMESTIC MINING SHOULD BE FIRST

The Commission's predisposition toward the international viewpoint is set forth early in the five-volume report. "There is no such thing," it pontificates, "as a purely domestic policy toward materials that all the world must have; there are only world policies that have domestic aspects." This is putting the legendary cart before the horse with a vengeance. The United States is the keystone of the free world. If this country fails to survive a hostile attack because of a world policy favoring foreign mines and rigging metal markets in their favor until the domestic industry sinks into ghost status, the rest of the globe will fall to communism like a ripe plum at harvesttime. National policy dictates the placing of domestic mining on a sound basis first; it will be time enough thereafter to expend surplus energy and funds, if any, upon development of contingent sources of supply.

The Commission does not assume toward United States mining the attitude exemplified by the infamous order L–208 of World War II, from whose effects

the gold mines still suffer, but subtly it would constrict and circumscribe domestic effort. It advocates for the traditional mining claim a complicated leasing system, giving the operator an apparent greater flexibility but no real title. It is all too reminiscent of the maneuvers of "Honest Harold" Ickes to reduce mine operators on the public domain to the status of tenants at will.

DEPLETION WOULD BE RESTRICTED

The report has received favorable publicity because of its advocacy of retention of percentage depletion in tax determination. But closer reading reveals the Commission's consistent policy of fencing in the domestic mining industry. In saying that rates now provided in the Internal Revenue Code should not be raised higher, the Commission invades the legislative sanctum and simultaneously sets up as a clairvoyant. If taxes go higher, percentage depletion must be raised accordingly, or many operators could not break even. Likewise, the Commission would cut down the list of minerals admitted to depletion. It recommends that the Congress reconsider the additions made in 1951. The restriction cat really pops out of the Commission's bag in the following passage:

"Application of the percentage depletion device should be confined to those minerals for which the hazards of exploration are great; a principle that apparently did not govern selection of most of the minerals added to the percentage depletion list by the Revenue Act of 1951."

The above comment (ignoring the basic fact that all mining deals with wasting assets requiring the setting up of depletion reserves if the operating companies are to survive their instantly exploited lodes) calls attention to the fact that but 1 of the 5 Commissioners is a mining man. Strict adherence to the quoted recommendation would eliminate coal from the percentage depletion list. The result would be seen in the increased operating cost of every coal-fired boiler in America, causing, by the chain reaction of costs from raw material produced to end-product consumer, vastly more expense to the national economy than any additional taxes extracted from the already too heavily burdened coal industry.

The Paley Commission's partisanship toward foreign mineral deposits is refreshingly countered by the Fulbright subcommittee of the Joint Committee on Defense Production. In Progress Report No. 20 (June 1952) relating to the aluminum expansion program, the subcommittee enunciates the sound doctrine that no strategic metal should be purchased abroad if it can be produced at home.

BEYOND THE SUBMARINE CURTAIN

The Paley Commissioners seek repeal of the "Buy American" clause, considering it a relic of "depression psychology." That clause is no antique, it is brand new, since by extralegal dictum of the President, it has hardly been used.

The report calls attempts to secure self-sufficiency "economic nonsense." As much nonsense as betting our wartime salvation on untried mines located beyond the submarine curtain?

Felix E. Wormser, vice president, St. Joseph Lead Co., New York, N. Y., says that: "The voluminous report of the President's Materials Policy Commission appears at a time of great national prosperity, and, under certain assumptions of industrial growth, paints a picture of serious prospective metal and mineral shortages. We have had similar alarms in the past, especially in oil. I might add that the St. Joseph Lead Co.'s study on lead does not confirm the Commission's analysis or forecast. The report makes many constructive recommendations, such as changes in our tax laws which, if carried out by Congress, would indeed stimulate mining in the United States and postpone some of the unpleasant events predicted by the Commission."

FREEDOM NOT IN RECOMMENDATIONS

The report professes to endorse the system of free enterprise under which our country has shown remarkable growth. It is, however, extremely difficult to reconcile this declaration for freedom with some of the recommendations made for the mining industry, such as the adoption of multilateral contracts with other countries, like the International Wheat Agreement. The International Wheat Agreement has cost the taxpayers of the United States about $600 million since 1949, through the purchase of wheat in the domestic market, at the market price, selling it abroad at lower prices, and compensating the farmer for the difference. It has cost the Canadian farmer some $135 million, as he hasn't been subsidized.

The Commission also recommends the establishment of international buffer stocks, a device which would sharply interfere with international trade resembling closely the cartels our own Government strongly condemns.

The Commission also recommends quotas, another tool of the planners, and exemplified by our recent experience with the International Materials Conference, an agency which decides how much copper, sulfur and other metals and minerals we shall be permitted to use. In other words, there would be drastic interference with the channels of international trade and the free market, if the controls recommended by the Commission were adopted. I don't believe any international group can reconcile conflicting eonomic national interests and function better than the free market. All history is against it.

TARIFF VERSUS FULL EMPLOYMENT

The Commission also recommends the elimination of tariffs on nonferrous metals. One of the principal reasons given for free trade is the contention that the United States has adopted the principle of full employment. Hence, tariff protection is no longer needed to safeguard miners' jobs. This, perhaps, is an indication of the fundamental thinking behind the President's Materials Policy Commission report. Full employment is the ingenious conception of the Keynesian school of economics so popular in Socialist Britain. Russia, of course, has full employment. How can anyone be so heartless as to oppose full employment? Unhappily, full employment means the surrender to the Government of precious freedoms, in exchange for security. I doubt very much Americans are willing to forego their precious liberties if the issue is clearly presented to them. Government coercion can bring about full employment, but I believe the average miner prefers freedom to make his own future.

John A. Wood, president, New Mexico Mining Association, Albuquerque, N. Mex., started his review by speaking about taxes. He commented: The Commission recommends retention of percentage depletion at existing rates; and it is commendable that the importance of depletion allowance has been thus recognized. However, it is my opinion that if certain increases in these rates were to be allowed, the industry would substantially increase the order of magnitude of exploration for domestic minerals. Suggested rates are: metals, 25 percent; nonmetals, 25 percent; sulfur, 25 percent; mineral aggregates, 15 percent; and coal, 15 percent. Rates should be based entirely on gross income.

REVISION OF MINING STATUTES

1. That no extralateral rights should be acquired with future claims or patents. Comment: The principle of extralateral rights is a device to protect the claim locator against adverse changes in dip which might not be inferred from lode outcrops and should be retained in the statutes.

2. That the annual requirement for improvement of unpatented claims should be increased to $250. Comment: It is entirely unfair to prospectors and small operators to require an increase in the dollar value of annual expenditure. For that matter, setting any dollar value at all is highly impractical and has proved so in the past. Annual improvement should be defined in terms of volume of material in place removed from the ground. The purpose of annual improvement upon an unpatented claim should be to require the locator to demonstrate faith in his discovery by continuing to search for valuable material.

3. That the improvement requirement for granting patent should be increased to $1,250. Comment: Here again an injustice would be worked upon the small operator by more than doubling the expenditure required to patent a claim. More important than setting a value on improvements for patent, in my opinion, is conclusive demonstration by the claim owner that the ground he desires to patent has yielded mineral of commercial value prior to the date of patent application.

4. That the Department of the Interior should be authorized to invalidate claims upon showing that the deposits discovered are insufficient to justify further development of the claim as mining property. Comment: Really, now, would you care to have such an arbitrary decision rendered at the bottom of your first 10-foot hole?

All in all, the authors of the Paley report must be highly commended for their thought-provoking analysis of the United States' raw-materials position. They have placed a great reliance on continued advances in technology to provide increasing utilization of more dilute concentrations of minerals, which would

ultimately make possible the complete recycling of many materials and thus afford an inexhaustible supply.

The United States mineral industry can do a magnificent job here at home if it gets really favorable treatment.

William M. Stoll, mining engineer, Seattle, Wash., reviews the report as follows: The report purports to be a minerals-policy guide, and is doubtless intended to and probably will have great influence in future legislation concerning mining and minerals policy. Certain of the ideas advanced deserve close scrutiny by mining people as to their impairment of freedom.

Certain ideas advanced by the report appear to follow closely—too closely—ideas that have been advanced formerly by the United States Department of the Interior. These ideas have had in common the tendency to diminish or destroy the independence of prospectors and mining people and to generally tear down the traditional rules they have long operated under.

SAME LEASING SCHEME—NEW APPROACH

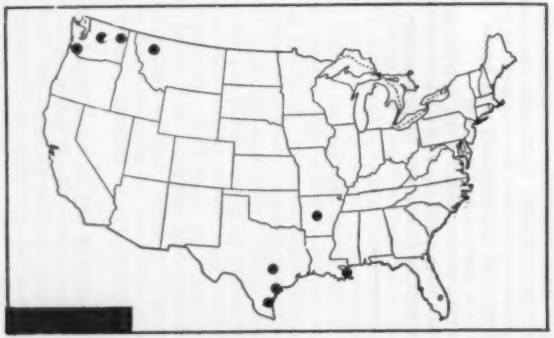
For years the Interior Department has been attempting to extend the Government leasing system to metalliferous deposits, to collect vast data on who is doing what, grant permits, and generally assume a position of management over exploration, development, and mining activities. The Paley Commission's report is an ideal vehicle by which they may achieve their objectives, unless Congress is wary. The report proposes that leasing be made optional, as an alternate to the traditional rights of location and patent. Thus their approach is now more cautious, having earlier run into trouble when the Interior Department sent up a trial balloon on the same matter.

Evidently the Bureau of Land Management does not care for the mining customs and laws that have grown up in the United States as a result of practical experience since 1849. This spirit reflects a relentless urge to control and centralize, to manage and to dominate—whereas the traditional laws and customs leave the essential elements of freedom and decision to the miner. That is where it belongs, since it is he who risks his time and work. The report goes further than this; it proposes that all new claims be invalid unless recorded in the central temple of authority and largesse. It also has the temerity to propose that the current Interior Department regulation permitting its examiners to deny sufficient showing for patent be extended to include the final power to invalidate claims on which the Department decides development is not justified. Those experienced in mining geology and examination will know this for an unjustified and cruel power, if it is ever granted by Congress.

These proposals, if enacted into law, would destroy the spirit and the letter of United States mining law as it has been built up and come to be accepted by thousands of mining people—from mining companies to prospector.

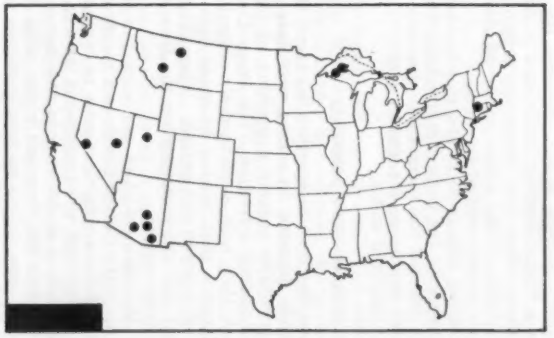
United States Mining Today—A $2 Billion Expansion

Look carefully over this simple listing of new mining projects now under way. This is a period of growth without parallel



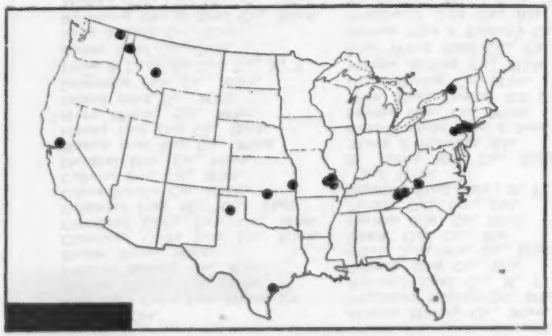
Leading the nonferrous metals in both size of investment and tonnage increase, the U. S. aluminum industry will double its 1950 production capacity by 1955.

NEW PROJECTS	INVESTMENT
Aluminum Co. of America, Point Comfort, Tex.	$35,000,000
Aluminum Co. of America, Wenatchee, Wash.	85,000,000
Aluminum Co. of America, Rockdale, Tex.	85,000,000
Kaiser Aluminum Co., Chalmette, La.	200,000,000
Kaiser Aluminum Co., Mead, Wash.	20,000,000
Reynolds Metals Co., Corpus Christi, Tex.	83,000,000
Reynolds Metals Co., Longview, Wash.	18,500,000
Reynolds Metals Co., Little Rock, Ark.	55,000,000
Anaconda Copper Mining Co., Kalispell, Mont.	45,000,000
Total investment	**$626,500,000**



Never in history have so many large-scale copper mining projects been launched in so short a time. Manning and staffing them will be the chief problem.

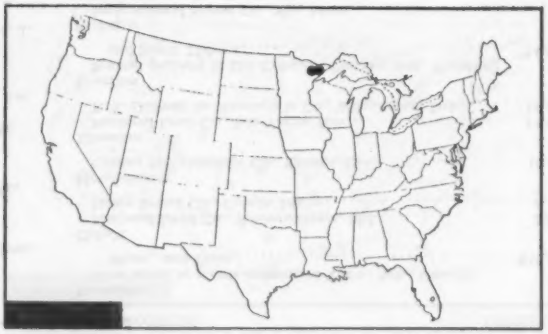
NEW PROJECTS	INVESTMENT
Anaconda Copper Mining Co., Butte, Mont.	$27,000,000
Anaconda Copper Mining Co., Yerington, Nev.	38,000,000
Anaconda Copper Mining Co., Refinery expansion	5,500,000
Anaconda Copper Mining Co., Brass mills & misc.	40,500,000
Phelps Dodge Corp., Bisbee, Ariz.	25,000,000
Miami Copper Co., Copper Cities, Ariz.	15,000,000
Copper Range Co., White Pine, Mich.	57,000,000
American Smelting & Refining Co., Silver Bell, Ariz.	17,000,000
Kennecott Copper Corp., Deep Ruth Project, Nev.	14,000,000
San Manuel Copper Co., Oracle, Ariz.	111,000,000
Calumet & Hecla Cons. Copper Co., Osceola Mine, Mich.	6,000,000
Total investment	**$356,000,000**



New discoveries in Tennessee and new mines in the East and the Northwest bring in production to replace declining output of older districts. Smelters are expanded.

NEW PROJECTS	
American Smelting & Refining Co.	Palmerton, Pa.
Corpus Christi, Tex.	Ogdensburg, N. J.
Selby, Calif.	Blackwell Zinc Co., Blackwell, Okla.
Van Stone Mine, Wash.	Universal Exploration Co., Jefferson City, Tenn.
Amarillo, Tex.	Bunker Hill & Sullivan M. & C. Co., Kellogg, Idaho
Newark, N. J.	American Zinc Co., of Tenn., North Friends Sta., Tenn.
St. Joseph Lead Co.	Eagle Picher Co., Galena, Kans.
Balmat, N. Y.	Anaconda Copper Mining Co., Butte, Mont.
Indian Creek, Mo.	
Herculaneum, Mo.	
Haydon Creek, Mo.	
New Jersey Zinc Co.	
Austinville, Va.	
Friedensville, Pa.	

Total investment $79,000,000

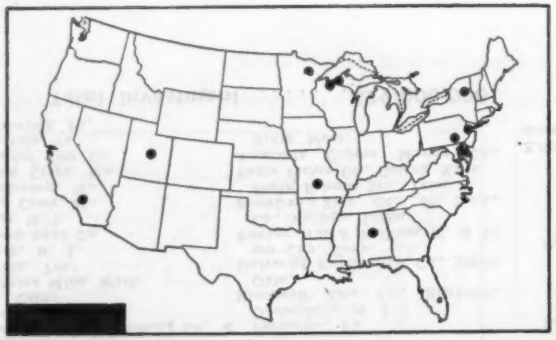


The largest investments in any single mining industry enterprise will be made in taconite mining and milling. When completed, the Erie plant mentioned below will be the largest in the metal mining field.

NEW PROJECTS	INVESTMENT
Erie Mining Co., Aurora, Minn.	$298,000,000
Scheduled first production	— 1956
Probable full production	— 196?
Final capacity, tons ore/day	— 88,000
Final capacity, tons conc./yr.	— 10,500,000
Reserve Mining Co., Beaver Bay, Minn.	(approx.)*$300,000,000
Scheduled first production	— 1955
Probable full production	— 196?
Final capacity, tons ore/day	— 83,000
Final capacity, tons conc./yr.	— 10,500,000

* Estimate of probable cost of completed plant. No figure released by Reserve as yet.

Total investment $598,000,000

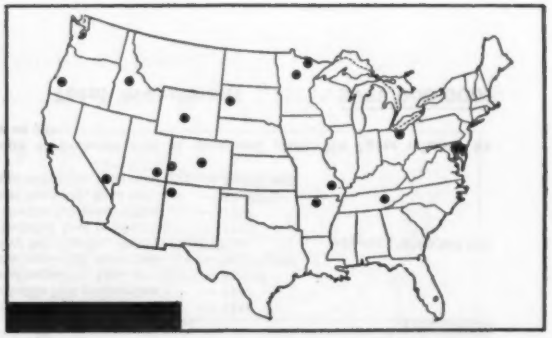


Ever-increasing demand for steel calls for tremendous expansion in iron ore output. These are all iron mining projects, other than taconite.

NEW PROJECTS

Armco, Tex.	Morton Mining Co., Minn.
Bethlehem Cuba Iron Mines, Pa.	Negaunee Mining Co., Mich.
Balkan Mining Co., Minn.	National Lead Co., N. Y.
Bennett Mining Co., Minn.	Odanah Iron Co., Wis.
Butler Bros., Minn.	Oliver Iron Min. Co., Mich.-Minn.
Cleveland Cliffs Iron Co., Minn.	Ozark Ore Co., Mo
Cleveland Cliffs Iron Co., Mich.	Puritan Min. Co., Mich.
Columbia Iron Min. Co., Utah	Pyrites Co., Inc., Del.
Coons Pacific Co., Minn.	Republic Steel Corp., N. Y., Ala., and Minn.
Cuyuna Ore Co., Minn.	St. James Min. Co., Minn.
Douglas Min. Co., Minn.	Shook & Fletcher, Ala.
Hanna Iron Ore Co., Minn.	Sloss-Sheffield Steel & Iron, Ala.
Hanna Iron Ore Co., Mich.	Snyder Min. Co., Minn.
Hoyt Mining Co., Minn.	Tenn. Coal, Iron & RR Co., Ala.
Inland Steel Co., Mich.	Utica Mining Co., Minn.
Interstate Iron Co., Minn.	Verona Mining Co., Mich.
Jones & Laughlin Ore Co., N. Y.	Alan Wood Steel Co., Pa.
Kaiser Steel Co., Calif.	Warren Pipe & Foundry Co., N. J.
Lake Mining Co., Minn.	Woodward Iron Co., Ala.
Mahoning Ore & Steel Co., Minn.	Youngstown Mines Corp., Mich.
Mesaba Cliffs Iron Min. Co., Minn.	

Total investment $261,500,000



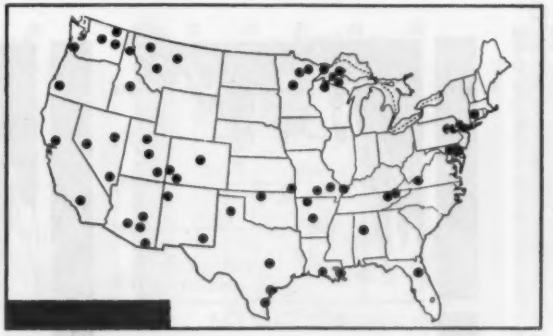
New emphasis on alloys, plus increased demand for metals like titanium, put the spotlight on so-called minor metals. These are only a few of the new projects in operation or planned.

NEW PROJECTS	INVESTMENT
Manganese	
New mines or plants opening in Tenn., Ark., Nevada, Minn., and Ohio	$15,000,000
Cobalt	
National Lead Co., Fredericktown, Md.	5,000,000
Howe Sound Co., Cobalt, Idaho	8,500,000
Molybdenum	
Climax Molybdenum Co., Climax, Colo.	10,000,000
Titanium	
National Lead Co., Las Vegas, Nev.	14,000,000
E. I. DuPont de Nemours & Co., Wilmington, Del.	15,000,000
Uranium	
Several projects in the Colorado Plateau area, Wyoming and South Dakota	14,000,000
Nickel	
International Nickel Co., Ely, Minn.	
M. A. Hanna Co., Riddle, Ore.	

Total investment $81,500,000

So widespread in the range and complexity of its operation, expansion in metallic mineral industry can only be approximated. These are only some of the larger projects now under way.

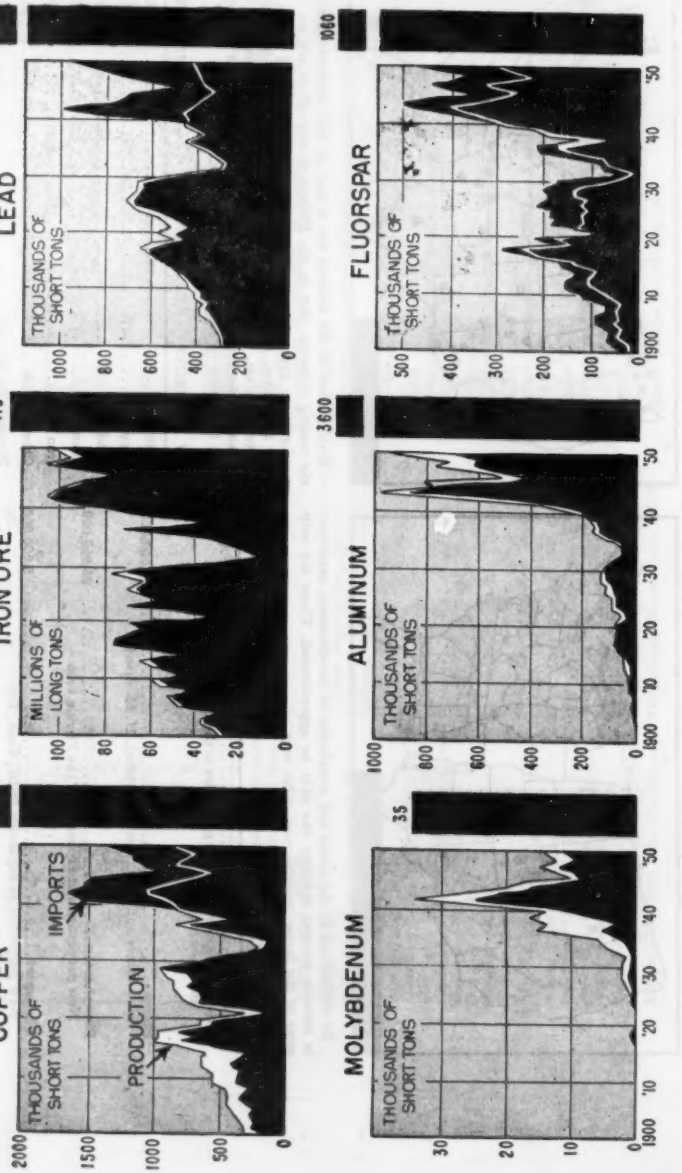
NEW PROJECTS	INVESTMENT
Sulphur Several new or expanded properties in the Gulf Coast area and elsewhere	$25,000,000
Potash New mines and expansion in Carlsbad, N. M. district	28,000,000
Phosphate New properties and expansion in the Florida field	25,000,000
Fluorspar New properties or expansion in Ill., Colo., Del.	5,000,000
Total investment	**$83,000,000**

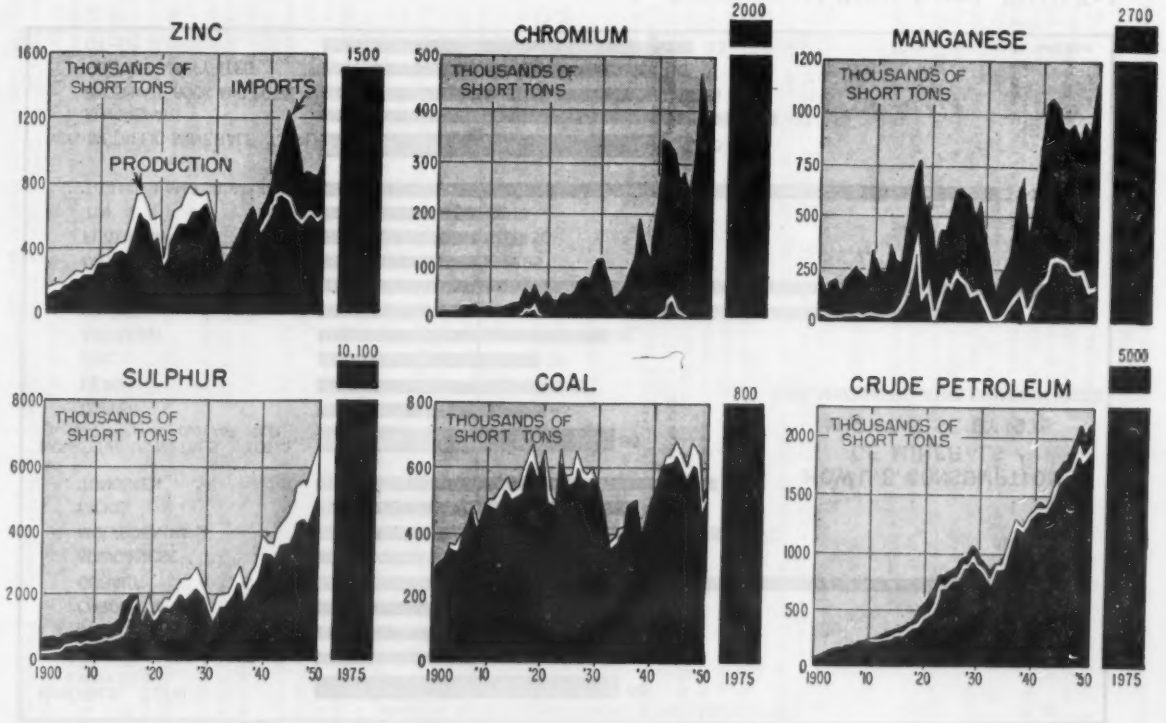


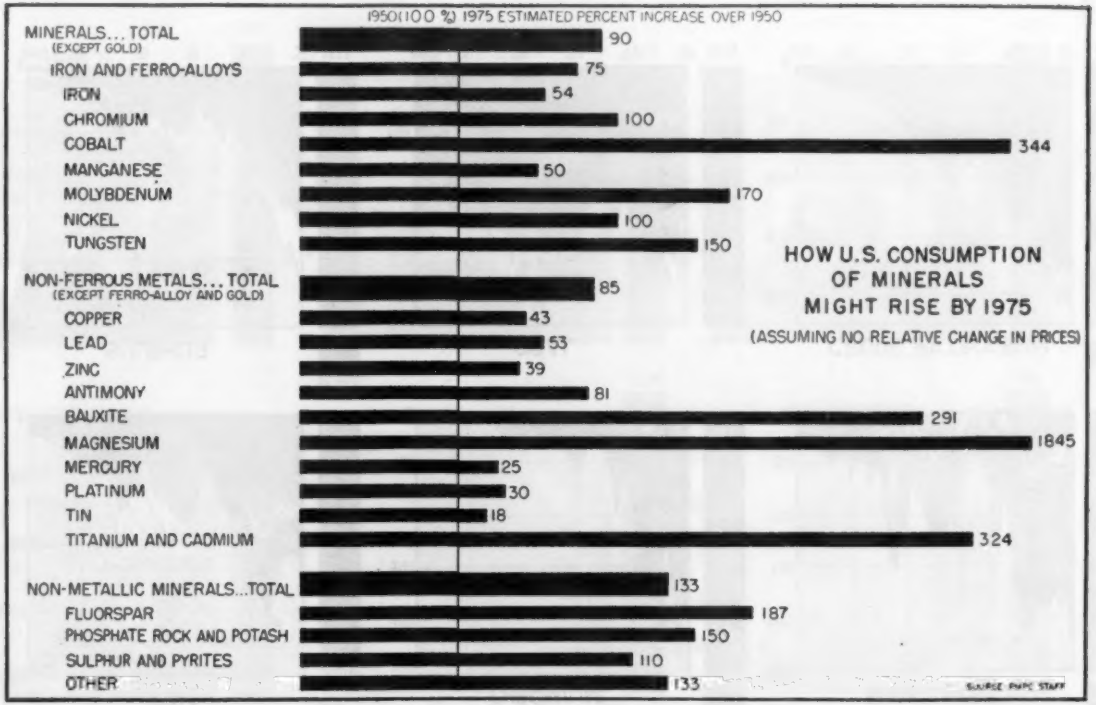
Each section of the country has a part in this tremendous growth of the mining industry. Not in the lifetime of any of us are we likely to see again so great an expansion of productive capacity in so short a time. Remember, too, that these are only the highlights of mining's expansion program. There are hundreds of smaller-scale projects in every segment of the industry, the combined output of which is of real significance in helping to swell production figures.

NEW PROJECTS	INVESTMENT
Aluminum	$626,500,000
Copper	356,000,000
Lead-Zinc	79,000,000
Taconite	598,000,000
Iron Ore	261,500,000
Other Metals	81,500,000
Nonmetallic Minerals	83,000,000
Total investment	**$2,085,500,000**

These charts show past United States production and consumption of raw materials and give estimates of the future, based on needs of growing United States population. The white areas, or lines show production; black areas show consumption. Where black extends beyond white lines, United States is importing that much. Red bars show projected United States demands in 1975. The figures over red bars give quantity estimates. See article for technique used.




ZINC
THOUSANDS OF SHORT TONS
IMPORTS
PRODUCTION
1600
1200
800
400
0
1500
CHROMIUM
THOUSANDS OF SHORT TONS
500
400
300
200
100
0
2000
MANGANESE
THOUSANDS OF SHORT TONS
1200
1000
750
500
250
0
2700
SULPHUR
THOUSANDS OF SHORT TONS
8000
6000
4000
2000
0
10,100
COAL
THOUSANDS OF SHORT TONS
800
600
400
200
0
800
CRUDE PETROLEUM
THOUSANDS OF SHORT TONS
2000
1500
1000
500
0
5000
1900 '10 '20 '30 '40 '50 1975


1950(100 %) 1975 ESTIMATED PERCENT INCREASE OVER 1950
MINERALS... TOTAL (EXCEPT GOLD) 90
IRON AND FERRO-ALLOYS 75
IRON 54
CHROMIUM 100
COBALT 344
MANGANESE 50
MOLYBDENUM 170
NICKEL 100
TUNGSTEN 150
NON-FERROUS METALS... TOTAL (EXCEPT FERRO-ALLOY AND GOLD) 85
COPPER 43
LEAD 53
ZINC 39
ANTIMONY 81
BAUXITE 291
MAGNESIUM 1845
MERCURY 25
PLATINUM 30
TIN 18
TITANIUM AND CADMIUM 324
NON-METALLIC MINERALS...TOTAL 133
FLUORSPAR 187
PHOSPHATE ROCK AND POTASH 150
SULPHUR AND PYRITES 110
OTHER 133
HOW U.S. CONSUMPTION OF MINERALS MIGHT RISE BY 1975
(ASSUMING NO RELATIVE CHANGE IN PRICES)

[From Engineering and Mining Journal, September 1952]

UNITED STATES MINING TOMORROW—DEMAND FOR MINERALS UP 90 PERCENT BY 1975

THAT'S THE CONCLUSION OF THE PALEY REPORT, BRIEFED BELOW; AGREE OR NOT, YOU'LL BE INTERESTED IN IT

You don't have to read the five volumes (813 pages) of the report of the President's Materials Policy Commission, the Paley report, in order to find out what it is about. That's the purpose of this article, to summarize briefly: Who prepared the report, how it was written, what its forecasts are, and what suggestions it makes with regard to the mineral industry.

This summary makes no attempt to approve or disapprove any part of the report. You will find the comments of several mining men on the following pages. Our own opinion was expressed editorially in the August issue.

The Paley report will be discussed or quoted or condemned at mining meetings for years to come. We offer this summary as background for your own part in these discussions or for any further study you may care to make.

1. WHY THE REPORT WAS MADE

Statistics show that demand for the raw materials of the world is tending to outrun available supplies. That means trouble, all the way from economic hardships to outright war, as the nations of the world struggle to get the material they need.

The Paley Commission, most of its members good Republicans, was set up by President Truman to study the long-range needs of the United States so that some kind of intelligent planning could be done to keep enough raw materials coming to United States industry, but to avoid the worldwide upsets that an uncontrolled rush to buy materials could cause.

The Commission was directed to aim its investigation at the decade 1970–80, or for convenience sake, the year 1975.

2. WHO MADE THE STUDY?

These are the Commission's members:

Chairman: William S. Paley, chairman of the board, Columbia Broadcasting System, New York, N. Y.

Arthur H. Bunker, president, Climax Molybdenum Co., New York.

George R. Brown, executive vice president, Brown & Root (engineers), Houston, Tex.

Eric Hodgins, member board of editors, Fortune magazine, New York, N. Y.

Edward S. Mason, professor of economics, Harvard University, Cambridge, Mass.

These men appointed Philip H. Coombs, of the Ford Foundation, as director of the work of the Commission. As he began developing an organization, the Commission got various experts in their fields to make reports, or preliminary studies to guide later work. For example, the Commission (abbreviated as the PMPC hereafter) got Prof. Raymond F. Mikesell, of the University of Virginia, to report on foreign resources, and Alan M. Bateman to recommend the course of geological studies.

Most of the full- or part-time staff of over 200 persons came from Government agencies. Some came from colleges or from industry. In addition, the PMPC called in as consultants, or for frequent conferences, a great many men from the raw materials industries.

Special studies were made for the PMPC by such organizations as: Battelle Institute, the Koppers Co., Standard Oil Development Co., the National Research Council, Arthur D. Little Co., American Standards Association, the USGS, the USBM, and many others.

A detailed questionnaire went to 275 mining companies and the response that resulted was extraordinary high.

A mountain of information was collected and boiled down into the report. The volume on technology is particularly good in this respect. Unpublished material was turned over to the NSRB.

3. WHAT THE REPORT IS BASED ON

The report's basic idea is that the United States standard of living is threatened by a gradual rise in the cost of producing raw materials. By cost the PMPC doesn't mean just dollar cost, but real cost, which is the hours of labor and

amount of capital needed to put a pound of copper, let's say, into useful form.

Until recently, there was no doubt but that real costs were declining. Now, the PMPC believes real costs are declining less rapidly and for some materials, may even be rising. If real costs of materials rise seriously, it means a corresponding rise in the prices we pay for nearly everything we buy, and a drop in our standard of living.

Here's the PMPC's statement of its major premise:

"The overall objective of a national materials policy for the United States should be to insure an adequate and dependable flow of materials at the lowest cost consistent with national security and with the welfare of friendly nations."

Reading the report, one finds strong emphasis on the least-cost principle as meaning that imports of metals should be encouraged, as against development of mineral self-sufficiency, at a high cost in the United States. The report recognizes the strategic problem in such dependence on foreign sources, but it puts the chief emphasis on cost as the criterion in foreign versus domestic mining of a commodity.

The PMPC's attitude on Government in business is that private enterprise is the best means of securing and maintaining a high standard of living, but that there are many things Government can and should do to make private industry's job more effective. Financing research on means of exploring for blind ore bodies is one example of a needed job that industry can't, or won't, do on a risk basis. The report outlines others.

4. HOW THE REPORT'S ESTIMATES WERE MADE

The basis of the report's projections of demand for minerals in 1975 (as pictured in the charts at the head of this article) is an estimate of the working force, the population, and the gross national product of the United States in 1975. Briefly, this is how they arrived at it.

The working force, by which is meant everyone able and willing to hold a job, has always come to 56 percent of the number of people over 14 years of age. Because most of the people who will be in that group by 1975 are already born, the Bureau of the Census estimates that there'll be 146 million people 14 years old or over by 1975. This means a labor force of about 81.7 million.

Assuming full employment (with about 3 percent unemployed), and assuming that the productivity of labor increases about as it has in the past, this working force can produce about twice as much in 1975 as is produced now.

The population will have grown by then to about 193 million people, according to the estimate of the United States Census Bureau, and it should absorb this doubled production.

Based on the probable demands of this increased population in terms of such things as houses, automobiles, airplanes, television sets, other appliances, books, telephones, etc., the PMPC has worked back to the probable demand for each metal or mineral. They have tried to be conservative, and they've recognized trends in technology, both in production and use, and in substitution of one material for another.

5. WHAT REPORT'S ESTIMATES MEAN TO MINING

The projected demands for 1975, arrived at as explained above, are shown in the charts at the head of this article. The overall demand in the United States for metals and minerals is expected to be 90 percent greater in 1975 than it was in 1950. You'll have to judge for yourself whether or not 1950 was a good year to use as a comparison.

There isn't space to detail the PMPC's analysis of each metal or mineral, but the percentage increases seen for each one are shown. Accuracy of the PMPC's estimates for supply, or demand, of some materials, lead and sulfur for example, is questioned severely by some industry members. The PMPC has been careful to point out that these data are not offered as absolute predictions, merely educated guesses.

6. WHAT THE REPORT PROPOSES FOR MINING

On taxation, that domestic corporations with foreign subsidiaries get certain tax benefits; that present limitations on expensing of exploration costs be removed; that percentage depletion be retained at present rates, but that easily found materials, recently added to the eligible list, be removed.

On mining claims, that prospectors should have a choice of leasing, as well as patenting, mineral lands; that only tracts on which exploration leases or permits are granted be closed to general prospecting; that tracts leased should be recorded; that tracts be leased large enough to permit geophysical prospecting.

Also, that all nonpatented, as well as patented, claims be recorded; that future claims be limited to mineral deposits only, with no other surface rights or extralateral rights granted; that annual improvement requirements be raised to $250 for unpatented, and $1,250 for patented, claims; that the Interior Department be given certain new powers to invalidate claims; that a claim not put up for patent in 10 years become invalid automatically.

On aid to small mines, that a system of financial aid to small mining be established, run by the USBM, to advance up to $100,000 to support exploration or development of "minerals of strategic importance for which domestic reserves are inadequate." Applicant for such aid to supply at least 25 percent of total funds used; total advances to be limited to about $15 million over any 5-year period.

On stockpiling, that stockpiling of strategic and critical materials be a permanent part of the United States policy, with enough funds provided for orderly purchases at all times; that vulnerability to attack of all Western Hemisphere sources be evaluated in setting stockpile goals; that study be made of any better means than stockpiling to promote national security; that stockpiling be done at minimum cost without favoring any producer or group; that buy American clauses in present stockpile act be eliminated; that nothing be taken out of the stockpile except during declared emergencies when national security clearly requires it.

On fact gathering, that each agency of the Government concerned with primary data on materials strengthen its own fact-gathering analytical, and programing machinery as related to mining; that the NSRB act as central collecting and reporting agency for all these facts and programs; that special attention be given the problems of small mines; that the mining industry, through the AIME, collect data on ore reserves, cost of exploration, rates, trends, and prospects of discovery, all this to be turned over to the Government; that the United Nations keep mineral statistics on a worldwide basis and set up study groups as needed.

Also, that a complete census of mineral industries be taken in 1954 and every 5 years thereafter; that the USGS expand its mapping program 100 percent as fast as possible; that a coordinated national system of libraries of drill samples, cores, and data be set up by the USGS and the USBM; that intensive research be done on new ways of finding deeply buried ore bodies, this to be run by a committee from Government, industry, and universities; that direct exploration by Government be limited to those situations where risk is so great, private industry can't afford to take it.

On the St. Lwarence seaway, that the transportation end of it be started at once, for security reasons.

On aid to foreign mining, that our Government should deal with foreign governments to get better treatment for United States investors abroad; that technical assistance programs abroad be stepped up to about $4 million in aid yearly; that the work of the DMPA abroad be made permanent and that it be allowed to make up to 10-year contracts for foreign-produced minerals, with price floors as needed; that foreign mineral production be financed by special funds outside loans from Export-Import Bank, that such loans be limited to 50 percent of total investment required.

On tariffs, that a law be passed, apart from the Reciprocal Trade Agreements Act, permitting the wiping out of the United States tariff on any industrial material when the United States is, or is expected to become, "substantially dependent on imports" of it. For example, that could cut out the tariff on lead right now.

On market stability, that serious consideration be given to building up international buffer stocks (ever-normal granaries) of metals, to be run by an international agency. The idea would be to buy in bad times, sell in good times, thus stabilize world prices of metals and thereby encourage new investment in mining. The PMPC believes private capital won't take the risk much longer of seeing its investments in mining endangered by a fluctuation in metal prices.

This is probably the most controversial issue raised by the PMPC's report.

The editors have available a listing of these proposals, together with the PMPC's analysis of the outlook for specific minerals or metals. To obtain a copy, simply address your request to: The Editor, Engineering and Mining Journal, 330 West 42d Street, New York 36, N. Y. For the complete report write to the

Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. Price is $6.25 for all 5 volumes, or $4.50 for volumes I, II, and IV, in which you'll be most interested.

Here Are the Views of Some Mining Men on the Paley Report

"A discussion of alternative plans is essential"

Arthur H. Bunker, Member of PMP Commission and president of Climax Molybdenum Co., New York, N. Y.

"Knowing quite well how subject to change any personal plans may be when made for more than a year or so ahead, each member of the President's Materials Policy Commission had full appreciation of the toughness of the assignment given him in trying to peer 25 years into the future.

"None of us welcomed the role of prophet, yet the task given us inevitably required a kind of prophecy. We have done our best with the assignment and we strongly feel that a discussion of alternative long-range plans is timely and essential.

"We do not offer this report as a detailed picture of the world of 1975. We never intended it to be, as we believe is very clear from the text itself; nor do we advance the projections and the proposals in the report as a sort of gospel to be embraced or rejected all of a piece.

"We do offer these suggestions for consideration as possible adjuncts to affect working of the profit motive system of economics in that world of 25 years hence, the outlines of which we have tried in general terms to trace. That is the system by which we all live and in which I need hardly say we all believe. That is the spirit in which the Commission offers this report for study and debate. If it focuses attention upon this materials problem, if it promotes widespread debate on the best methods of solution and reaps intelligent discussion rather than acrimony, it will have served a big purpose."

"Proposals will influence legislative action for a long time"

Horace M. Albright, president, United States Potash Co., New York, N. Y.

"Looking at the report of the President's Materials Policy Commission solely from the standpoint of the mining industry, I think it contains a vast amount of valuable data on the mineral resources of our country and the world and presents pretty sound estimates of our mineral requirements for the next 25 years.

"The report is based on resource and production figures furnished by the mining industry itself. The estimates of metals and minerals needed in the foreseeable future had the expert analysis of able men who are thoroughly familiar with industrial and defense requirements.

"Some of the proposals made with reference to mining law revision and change in tariff and other foreign-trade policies probably will be widely debated, and there will be disagreement as to whether they are practicable or in harmony with our private-enterprise system. My own view at this time, with deeper study of the report still be to undertaken, is that a great job has been done and that the Commission's data, opinions, estimates, and proposals will influence legislative and administrative action for a long time and for the general benefit of the Nation's economy.

"In my judgment the Commission is an exceptionally competent group of men in whom the mineral industry should have great confidence, even though there may be disagreement with some of the findings and some of the proposals advanced in the report."

Report has an "objectivity unexpected considering its origin"

Harrison Schmitt, Silver City, N. Mex.

"The report is admirably organized and written, with an objectivity unexpected considering the origin of it. The critical theme, the now current dangerous gap between our production of many materials and our industrial needs in the face of possible enlargement of the war, is adequately dramatized. This, if given sufficient publicity, will perform an essential service.

"As might be anticipated where solutions are proposed, strong emphasis is put on Federal direction and control. With the present threat to our security, councils of caution are on a defensive level."

"TARIFF REMOVAL IS NOT FEASIBLE OR EQUITABLE . . ."

Andrew Fletcher, president, St. Joseph Lead Co., New York, N. Y.

"The President's Materials Policy Commission has presented a vast amount of pertinent information about the mineral industries in an attractive and scholarly manner. I am in hearty agreement with many of its observations, especially those pertaining to mining taxation. However, certain fundamental conclusions and recommendations do not appear to be for the best interests of the public or the United States mining industry. For example:

"1. Tariff removal is not feasible or equitable so long as the domestic miners, with relatively low-grade ores and high labor rates, must purchase foodstuffs from a subsidized agriculture, and materials or equipment in a tariff-protected market. A prosperous mining industry is essential for our defense, and, as an incentive for production, a tariff is more desirable than a discriminatory Government subsidy, such as the wartime premium-price plan. A sliding scale tariff would be preferable, in which the highest tariff protection would occur during depressed world market conditions and graduated downward as prices rose, until completely eliminated under abnormal international conditions.

"Incidentally, the Commission's argument for the abolition of tariffs is based upon "a full employment situation," which cannot always be assured except in a socialized economy.

"2. It is difficult to reconcile the Commission's endorsement of the free enterprise system, with their recommendation of such specific Government control devices as: '(*a*) the multilateral contract; (*b*) international buffer stocks; (*c*) international buffer stocks combined with limited quota arrangements.'

"The Commission's recommendations appear to be variations of the ancient, ever-normal-granary philosophy, which has been proved unworkable and inadvisable from the Egyptian civilization down to the present. There is no reason to believe that governments which cannot stabilize their own affairs, or balance their budgets, can collectively stabilize metals and minerals sold in international trade. Both the House and Senate recently adopted provisions that reject the injurious controls established by the International Materials Conference. It is therefore disappointing that the Commission should endorse the 'distribution of world supplies * * * and the stabilization of raw material prices.'

"3. I do not agree with the Commission's forecast of a serious lead shortage with a commensurate high price, and the necessity of instituting conservation measures for this metal. The studies made by the St. Joseph Lead Co. do not substantiate the Commission's conclusions. It would be most unfortunate if the domestic mining industry and its customers were persuaded to accept governmental controls because of the fear of a lead or other metal shortage created by the Commission's predictions. There can be no shortage, if the law of supply and demand functions in a free market economy—untrammeled by Government controls."

FREE ENTERPRISE IS ESSENTIAL IF COUNTRY'S GROWTH IS TO CONTINUE AS PROJECTED

(Arthur Notman, 55 Liberty Street, New York, N. Y.)

"On the basis of my previous examination of the specific drafts on copper, lead, and zinc made by the Commission's staff, which are substantially unchanged in the report, I feel that those topics were carefully and objectively considered.

"Any extrapolation for 23 years into the future as to demand, supply, and price for even such fundamental raw materials for our civilization can be made only on the experience of the past. This was unquestionably the approach of the staff of the Commission with the Commission's full approval, if not as the result of a directive from it.

"It seems to me, however, that in dealing with our domestic economy, which has so far outstripped the rest of the world, with the sole exception of Canada, in a steadily rising standard of living resulting from our American philosophy of 'free enterprise,' such a projection of continued growth must depend on the assurance that this philosophy is to continue as the economic environment of our future. Without such assurance, the validity of the projection may be seriously questioned, or even discarded.

"I feel strongly that a supposedly nonpartisan objective approach to this problem of future requirements should not ignore by silence the unmistakable departures from the basic philosophy upon which the United States economy has flourished in the past.

"If my thinking is sound, it should constitute the most important issue to our own industry as well as to the country as a whole in the coming election."

"A REHASH OF MUDDY WASHINGTON THINKING"

(S. H. Williston, vice president, Cordero Mining Co., San Francisco, Calif.)

"The President's Materials Policy Commission has apparently been unable to avoid the pitfalls of Washington bureaucracy. Mr. Paley and the other able members of the Commission proper have sacrificed a great deal of time and effort to make a rehash of muddy Washington thinking.

"An examination of the list of staff members and a discussion of its members with production experts in the mining industry indicates few or none have had any actual mining experience within the last 10 years, if then.

"On the staff are those who have been held responsible for the State Department's policy of keeping the American minerals in the ground, and pseudo-economists, who have long advocated an American have-not policy and a desire to become entirely dependent on foreign sources of our raw materials. A few competent Survey and Bureau personnel have become completely submerged in the final results.

"The reserve figures for several of the minor metals are completely wrong.

"Probably the fundamenetal error of the committee's report has to do with its lack of recognition of one basic fact: domestic mining must pay for its labor in a tariff-protected climate. Through the actions of the Reciprocal Trade Pact and as a result of the depreciation of the value of the dollar, metal tariffs have declined to insignificant percentages.

"United States mining, save in exceptional cases, cannot live when it must pay for its labor and materials in a protected market and sell at world prices, yet this is exactly the basic recommendation of the five-volume report.

"The Commission points out, but does not emphasize, the fact that we were an exporting nation of copper, lead, and zinc until the time of the adoption of the Reciprocal Trade Pacts, but that since that time we have been steadily importing from abroad larger and larger amounts of our raw materials.

"Washington has been endeavoring to export our mining industry for 17 years, and the Paley Commission recommends the continuation of that policy.

"I regret very much having to make as unfavorable a comment as this on the work of the Commission, its able executive secretary, and some few of its staff, for all of whom I have the greatest respect."

"A MASTERFUL CONSOLIDATION OF FACTS"

(James Boyd, exploration manager, Kennecott Copper Corp., New York, N. Y.)

"We in the mining industry have struggled for a long time to obtain sufficient understanding of our problems so that policy would develop in such a way that the industry could more successfully meet its obligations to the Nation.

"The report of the President's Materials Policy Commission reflects the results of the most concentrated effort ever directed to this end. It is not the work of a group of inexperienced planners. Into it went untold hours of intensive search for the facts, which have been masterfully consolidated into a thoroughly understandable presentation. The Commission has used all the tools of a modern complicated economy—statisticians, economists, hard-headed businessmen, and every level of the industries involved. I know no example of a Government report which has been based on a more thorough attempt to obtain all viewpoints and to present them so masterfully.

"Because the industry is complicated by many differing viewpoints it is inevitable that some of the recommendations will prove to be unacceptable, and some, for fundamental reasons, should not be adopted. There is so much in the report that needs to be done, however, that attention should be focused on items which obviously demand immediate action. Attacks on the report as a whole, based upon specific objections, can only lead to destruction of its usefulness. Those points which are unsound will be ironed out in future debate. We owe a debt of gratitude to the members of the Commission and those who assisted them in compiling the report."

[From the August issue of the Guaranty Survey, monthly review of business and economic conditions published by the Guaranty Trust Co. of New York]

THE MATERIALS OUTLOOK AND FREE ENTERPRISE

The report of the President's Materials Policy Commission on Resources for Freedom is thought-provoking, not only because of its estimates of the future raw-materials needs of our expanding economy but even more because of the fundamental question it raises concerning politico-economic philosophy and outlook as applied to those needs. That question is whether the free processes of dynamic capitalism will continue to provide raw materials or whether the production, distribution, and prices of such materials are to be subjected to increasing political control.

MISTRUST OF PRIVATE ENTERPRISE

The gist of the Commission's five-volume report is that the United States, along with the rest of the free world faces grave future problems of raw-material supplies and that private business enterprise cannot safely be relied upon to do the job.

Under any administration with a predilection for intervention in economic affairs, such a view of the outlook and the Nation's needs could become the occasion or pretext for lasting political domination of the supply of basic raw materials.

A partial answer to the Commission's doubts on this score is to be found in the record of private enterprise. In the case of petroleum, for example, the far-sighted acquisition of foreign reserves by private corporations has done far more than furnish supplementary sources of oil for civilian needs in the United States. It has also done much to buttress the military strength of the "free world" in its efforts to provide safeguards against further Communist aggression. Similar foresighted action has been taken in steel, copper, and other basic industries.

The Commission proposes a set of devices to meet what it calls "the problem of materials market instability"—that is, in plain language, to manipulate prices, production, and exports by international agreement. Multilateral contracts on the model of the International Wheat Agreement would establish floor and ceiling prices. Buffer stocks would be bought and sold by a special international authority to offset natural fluctuations in supply and demand. "Quotas" or restrictions on production and exports would be used in conjunction with the buffer stocks to prevent long-continued downward trends in prices.

FREE ENTERPRISE NEEDS FREE MARKETS

The whole history of domestic and international trade bears witness to the difficulties and perils that arise from wellmeaning but misguided attempts at market manipulation. Almost every basic commodity entering into world trade has been the object of such attempts at one time or another. The record, it would seem, ought to be enough to discourage further experiments along the same line.

The Commission fears that the uncertainty of earnings due to price changes is a deterrent to the development of new resources. It has not been so in the past—not until governments or private groups have undertaken to insist upon market stability—or market rigidity—as the price of cooperation.

If free competitive enterprise is made truly free and truly competitive, there need be no fear that it will fail to make available all the materials needed on an economical basis.

It is generally the doctrinaire social planner who, ignoring the lessons of experience, argues that Government can do it better.

[From Business, September 1, 1952]

BUSINESS TIDES: "PLANNING" FOR 1975

(By Henry Hazlitt)

Several excellent comments—by the Wall Street Journal, by Lawrence Fertig in the World-Telegram and Sun, and by the Guaranty Trust Co. of New York in its August survey—have already appeared on the massive five-volume report

put out by the President's Materials Policy Commission. But a good deal more than this will need to be done both by individuals and groups if we are to have any adequate analysis of what Fortune lyrically hails as "one of the greatest, most readable Government documents of the century," and if we are to have any chance of heading off a new network of Government controls.

The technique of this report is familiar. It begins by fearing an alleged crisis; it ends by concluding that only more Government power, more Government controls, more Government bureaucrats, can save us from it.

The crisis this time is a deficit of raw materials. It seems that in 1900 this country produced 15 percent more than it consumed of raw materials other than foods and gold; that by 1950 this surplus had been supplanted by a 9 percent deficit, and that without more Government intervention this deficit may reach 20 percent by 1975.

Now even if this guess were right it wouldn't necessarily be alarming. England built itself up to the greatest industrial nation in the world in the 19th century by importing raw materials to export finished goods. In a peaceful world of free trade we could play a similar role.

But there is no good reason for supposing the Commission's guesses to be right. They are based on dubious deductions from a set of arbitrary assumptions. Why should we take seriously, for example, the guess that by 1975 we will need only 18 percent more tin a year but 1,845 percent more magnesium? Anyone would be lucky today to make a good guess concerning the 1975 consumption of any one item. It is sheer presumption to try to guess with an air of authority the relative consumption by 1975 of thousands of different items. Who can foresee today the vast changes that may be brought about by new discoveries, conversions, and inventions? Yet a Government that has persistently failed to guess even its own fiscal deficit a year ahead has no qualms about guessing every raw-material deficit 23 years ahead.

The report undertakes to rescue us by more of the same kind of Government interventions that have already become depressingly familiar. It proposes to manipulate prices, production, and exports; to establish quotas, floor and ceiling prices on the model of the International Wheat Agreement; and to create buffer stocks to be bought and sold by international authority to offset free fluctuations in supply and demand.

Do Government commissions ever learn anything from anything? Have they learned nothing whatever from a hundred dismal and disastrous failures of the past—from the British rubber restrictions scheme, the British African peanuts scheme, the Brazilian coffee valorization, our own potato controls, pig controls, cotton restriction, and ever-normal granary schemes? Must the world plunge into ever more grandiose international cartels, from the wheat pact to the Schuman plan to this latest proposal?

All these control schemes are the direct result of lack of faith in, and lack of understanding of, the free market. All this recent nonsense about each country's getting its just share of raw materials can only result in endless international bickering. Price controls, combined with allocations of raw materials to each country, can only unbalance and distort world supply, increase consumptive wastes, result in allocations to individual firms within countries, and so undermine competition and the growth or shrinkage of individual firms in relation to their relative efficiency. All these schemes can only end by further politicalizing every economic transaction—by socializing, regimenting, and eventually totalitarianizing our economy at home and throughout the so-called free world.

[From the Council for Technological Advancement, organized by and integrated with Machinery and Allied Products Institute for the purpose of advancing the technology of the United States, September 8, 1952]

Availability of Industrial Materials—A Report on United States Resources and Needs

One of the most interesting and challenging problems in the future of technological advancement in the United States is the availability and cost of primary production of industrial materials.

This subject recently has been impressively analyzed by a commission appointed in early 1951 by the President of the United States. The President's Materials Policy Commission is identified more fully later in this bulletin.

Obviously of large interest to industrial executives, the report of the Commission is necessarily long and complex. The brief description which follows is limited to the technical findings, and omits the Commission's recommendations for public and private action.

RAW MATERIALS DEFICIT

The major point of the comprehensive, five-volume report of the President's Materials Policy Commission is that the United States, long considered to be a land of inexhaustible resources, has now become a raw-materials deficit country. As is true of most investigations of this nature, the Commission found this to be no sudden development, but a characteristic of the last decade, which the Commission is the first to authenticate, if not reveal. Further, the Commission emphasizes that this is not a temporary situation due to the exigencies of the cold war. Instead, it is a problem which not only will prevail during the next quarter of a century, but will become of increasing severity even under the conservative assumption that the gross national product will continue to increase only at the same 3 percent compounded every year which has been the average of the last century, and that population will reach 193 million in 1975.

The following comparisons illustrate the nature of the problem: In 1900 the United States produced 15 percent more raw materials than it consumed (excluding food); in 1950, the United States produced 9 percent less than it needed. Under the assumption made above, in 1975 the Nation's raw materials output will fall 20 percent short of its estimated needs. Further, whereas the United States was once a large exporter of copper, lead, and zinc, it is now the largest importer of these metals. These and other comparisons are illustrative of the condition: "the United States is outgrowing its usable resource base."

PROBLEM OF COSTS

The crux of the problem lies in the increased demand for raw materials. This situation is especially severe in minerals. But it is emphasized that the problem is not one of absolute shortages. Rather it is one of the relentlessly rising costs in the extraction of raw materials from their natural state, and their conversion into useful commodities. The problem, then, is one of real costs, i. e., costs measured not in dollars, but in terms of the hours of human work and the amounts of capital required to bring a pound of industrial material or a unit of energy into useful form. It is in the relation between this increased demand and the shrinking supply of costwise readily available raw materials that the Nation is encountering obstacles in its path toward the twin goals of higher living standards and the strengthening of the national defense.

THE PROMISE OF TECHNOLOGY

The Commission's report discusses at length the ways and means whereby rising real costs can be halted, and a trend toward lower real costs, such as we enjoyed during the first 40 years of the century, can be reestablished. Of especial interest to members of the Council for Technological Advancement is the part that technology and modern science must play. This is the subject of volume IV of "Resources for Freedom" which is entitled "The Promise of Technology" and which contains a series of selected studies (e. g., "The Technology of Iron and Steel" by Clarence E. Sims, Battelle Memorial Institute; "Technology in the Building Industry" by Arthur D. Little, Inc.) dealing in the problems and the prospects of technology in improving the materials base of our economy. The report suggests that the demands which the materials problem places upon technology today are as follows:

THE DEMANDS UPON TECHNOLOGY

"1. To foster techniques of discovery: Although it is clear that our supplies of the abundant and accessible are running low geologists firmly believe that there is still a vast store of mineral materials deeper in the earth than we yet know how to discover or, discovering, know how to move and extract at costs comparable with the past.

"2. To bring into the stream of use, materials which so far evade our efforts: Silicon is the most abundant material in the earth's crust; but we do not yet know how to use it in any ways which take advantage of this abundance. Per contra, the desirable properties of oxygen are so well known that we have urgent

wishes to use it, and infinite quantities of it exist in the atmosphere. But so far we cannot bring it into industrially useful concentrations at a low enough cost to make its abundance significant to our needs.

"3. To apply the principle of recycling more and more broadly: Considered in its broadest terms, we wring material from the earth, we use it, and after its span of life it disperses by rot, fire, or corrosion back into the earth, into the air, or into the sea. Wherever this long cycle can be shortened we are able to use materials more intensively and thus with less net drain on what the earth still provides.

"4. To learn how to deal with low concentrations of useful materials: Metallic ores decline in concentration as we inevitably use the richest first and defer use of the leaner. Today we can recover copper from ores containing 0.5 percent of copper whereas half a century ago 3 percent was regarded as lean. But the problem is still broader than this. We pollute air and streams with sulfur because recovering it from high dilutions costs more than the sulfur is worth; we thus annually waste more sulfur than we use. The oceans contain most of the elements we need in industry, but so far only one metal—magnesium—can be economically recovered from its low concentration.

"5. To lessen or eliminate the need for a scarce material by substituting one that exists in greater abundance: The substitution of aluminum for copper as an electrical conductor is always the example that comes first to mind, but substitution can be more subtle and far reaching than this. The vacuum tube, new 40 years ago, was so remarkable a device that for years it occurred to no one to do more than improve it in detail. Most recently the creation of the transitor will make obsolete some functions of the vacuum tube, and in so doing makes a fraction of an ounce of germanium serve the same useful purposes as a much more complex instrument of metals and glass. This is substitution in its truly creative form.

"6. To develop and use more economically the resources that are renewable in nature: The sun yields boundless supplies of energy that technology can learn to harness, as it has put to use—and can further use—the power of falling water. Every day new supplies of wood, crops, and livestock are being created by natural processes. Here, in contrast to the exhaustible minerals, are important materials that need never run out. But these, too, can run out, and they will, without constant effort. One of the major tasks for technology is preservation of the production base of each renewable (resource) through better methods of holding soil and maintaining its fertility, of regulating stream flow, and perhaps of exercising some control over rainfall. Another task is increasing the annual production from each resource base."

CONCERN—NOT ALARM

The Commission makes an important distinction between being alarmist, which it believes it is not, and seriously concerned, which it is. The materials problem is not insoluble. In the past the flexibility of our economy has enabled us to broaden our resource base, to exploit new sources of supply, and to adapt our needs to the kinds of supply available. It is incumbent upon us to continue along this same path in the future, as well as to make more efficient use of a program of conservation which calls for the efficient development and use of resources as contrasted with either uneconomic squandering or a sterile hoarding of our resource base.

FIVE VOLUMES

"Resources for Freedom," the report of the Commission, is in five volumes: (I) Foundations for Growth and Security, (II) The Outlook for Key Commodities, (III) The Outlook for Energy Sources, (IV) The Promise of Technology, and (V) Selected Reports to the Commission. William S. Paley is Chairman of the Commission and its members George R. Brown, Arthur H. Bunker, Eric Hodgins, and Edward S. Mason.

CTA BOARD MEETS SEPTEMBER 24

The subject of industrial materials supply will receive further attention of CTA at a meeting of the Board of Trustees to be held in Chicago on September 24.

You are invited to address inquiry to the CTA offices should you wish further information on the Commission's report.

[From Mining World, October 1952]

CAPITOL CONCENTRATES: CONGRESS TO BE BYPASSED BY TRUMAN'S NEW MINERAL BOARD

The much-discussed Paley report proposes a vast number of changes in basic policies which have governed the exploration and development of the country's mineral resources. As many of the changes suggested are fundamental, it would seem that the Congress should make such alterations rather than Government departments and agencies. Congress should at least be given the opportunity to discuss them.

However, the plan seems to be to ignore Congress and go at the job through the agencies, and go at it so fast that even those most directly concerned will have but little opportunity to analyze the million-word report and let their views be known. In other words, it looks as though the recommendations are to be crammed down the mining industry's throats whether those directly concerned approve of them or not. A special task force has been created within the National Security Resources Board, under the direction of William H. Stead, to do the job.

The group, made up of representatives of 25 major departments and agencies of the Government, will review the recommendations made by the President's Materials Policy Commission (Paley Commission) and decide on ways of putting them into effect. Included in the task force are representatives of the Department of Interior, Atomic Energy Commission, Federal Power Commission, National Science Foundation, Defense Production Administration, Defense Materials Procurement Agency, and General Services Administration.

The special task force was created at the direction of President Truman and was ordered to make a detailed study of the Paley Commission's report and give him its own suggestions within 2 months. Meanwhile, the departments and agencies concerned with raw materials are to make recommendations to the President.

Mining men believe that the industries concerned should be given some opportunity to be heard. Where the recommendations involve changes in the basic structure on which our mineral industries have been built, Congress and congressional committees should make the decision, they say, rather than leave it to the group now in Washington whose philosophies reportedly often border on the red, or are decidedly pink.

STATUS OF MINERAL PROGRAMS ANALYZED

Before long the mining industry may expect to hear the details of a new copper program which is being talked over by DPA and DMPA. The present program, which is running out, has worked better than most of the others. It has kept a number of mines open which would have shut down and has made possible potential production 4 or 5 years from now. However, it has not stimulated the opening of the smaller mines.

There is no lead program outside of the purchase of a few thousand tons as cheaply as possible.

There is no zinc program and a large part of the industry is on the verge of shutting down. These shutdowns will affect the lead situation also.

The antimony business is shot, as is shown by the shutdown of our only major producer, the Bradley Mining Co.'s Yellow Pine Mine at Stibnite, Idaho.

An asbestos program is in the making in DMPA.

The tungsten program as far as the bulk of potential domestic operators is concerned is a flop. The Government knows why, but feels it can get its requirements from a handful of large operators and from imports. Recently DPA announced an increase in its requirement figures for tungsten amounting to 25 million pounds. Accelerated amortization and "other Government aids" will be given to operators who increase production.

What the domestic tungsten producers really need is a better price, or more refining capacity strategically located which will operate at lower costs, or both. Unless such action is taken the additional requirement will be supplied mainly from abroad.

The domestic manganese program has produced only a relatively few thousand tons of our requirements. A small-lot program at a price which seems high when compared with the market was recently announced, but the mechanics of the program are complicated and it is doubtful if it will be effective in creating important additional production.

The chrome program has resulted in the production of a few thousand tons in the Northwest under the stimulation of higher prices. It will be a year or two before the Montana chrome deposits can be put into effective production of a marketable product. Nearly 2 years were lost in Government paper work before this project was approved, although all the data were available from the last war, as well as a commercial process to utilize the chrome concentrates.

The price of ferromanganese has been increased by OPS. Ferrochrome may be expected to follow.

The fluorspar program has increased the supply materially.

The columbite-tantalite program will help production from abroad, but the agencies do not seem to be especially interested in exploring for domestic sources although there is a 90-percent Government-participation program on paper.

The mica program, as far as Government purchases are concerned, will not be of much help to domestic producers of strategic mica due to the famous "ruby" trade specifications. The exploration program, however, is quite active, and a good many applications have been approved especially in the South.

It is still hard to live long enough to get an application approved by DMPA or RFC. DMEA does much better.

In the meantime, the foreign expansion program proceeds merrily on its way with a minimum of personnel, little friction, many contracts written quickly and efficiently, and a vast outpouring of funds.

DISAGREES WITH PALEY REPORT CONCLUSIONS

A press release relating to the contract with San Manuel Copper Corp., sent out by the Defense Materials Procurement Agency, quoted a statement from Jess Larson which is in direct opposition to the conclusions of the Paley Commission concerning the future of this country in finding new ore deposits.

"The signing of the agreement with the San Manuel Corp. emphasizes two things about our minerals and metals situation," Larson said. "First, it produces tangible proof that the United States is a long way from exhausting its underground reserves of needed materials. Second, it brings us face to face with the cold fact that large mining operations do not spring up overnight * * * (and that) there is no escaping the fact that we have to think in terms of years—not months or weeks—on this kind of an operation."

The Paley report attempts to drive home the idea that the United States must look to foreign countries for future metal and mineral resources and that we should send our money abroad for their exploration and development. Citizens and taxpayers believe they should at least be given equal opportunities with those abroad. Many remember how the sealanes were closed by submarines when we badly needed metals and minerals during World War II. A map of submarine sinkings, published in Mining World in March 1951, indicated a tremendous amount of copper lying on the bottom of the ocean in the sealanes between Chile and the United States.

BUDGET LOOKS INTO MINERALS MESS

Reports from Washington say that the Budget Bureau is now studying the desirability of consolidating the functions of the emergency defense agencies which deal with minerals and metals. It is a sad situation when things are so bad that the Budget Bureau, which is responsible for some of the mess, gets busy on cleanup plans.

Commenting to Budget Director F. J. Lawton, Congressman Walter Baring, of Nevada, stated that he "had long maintained that there is a scandalous amount of 'red tape,' inertia, and buckpassing in these agencies." Baring called Lawton's attention to legislation which he sponsored in Congress to alleviate conditions. These included H. R. 3654, to establish an Office of Federal Minerals Coordinator; H. R. 5719, to finance the exploration, development, production, and production-expansion of critical minerals and metals; H. R. 5651, to set up a Mine Incentives Payments Division; and H. R. 5964, to establish a Department of Mineral Resources.

Baring confessed to Lawton that, despite his persistent efforts to get action, "no one has obtained less constructive results from the agencies in attempting to correct these organizational matters through legislation. The agency reports on the bills invariably are adverse and frequently point out that there is sufficient authority in existing legislation to accomplish the desired result did the administration desire to act."

The abuses, delays, and lack of action and results are well known to all, and the question is, Why has not some one acted?

FOREIGN COPPER IS DECONTROLLED

The Government has ordered decontrol of all sales of imported copper and copper refined from foreign ores, as well as imported copper raw materials and scrap. In addition, the brass and wire mills were given the go-ahead signal to increase their prices to reflect the higher price they are paying for imported copper. These increases are based on allocations of 60 percent domestic copper at the ceiling of 24.5 cents, and 40 percent foreign metal figured at 36.5 cents a pound.

Copper people express doubt that United States consumers will take all of the 53,000 tons of foreign metal they are entitled to buy for July. Therefore, they are wondering if the Government will buy the excess for the military stockpile.

There are rumors that the Government is trying to work out a civilian stockpile of copper—particularly as it applies to Chilean output.

THE AMERICAN TARIFF LEAGUE, INC., NEW YORK, N. Y.

TARIFF AND FOREIGN POLICY

(By Mr. Fred G. Singer, chairman the American Tariff League Executive Committee, delivered at the afternoon session, 67th annual meeting, the American Tariff League, the Plaza, New York, October 22, 1952)

A further point in our resolution is to be presented regarding intergovernmental commodity agreements. These ideas go back to the abandoned Habana charter for an international trade organization, chapter VI, to be exact. The charter was opposed by many Americans because it reflected disturbingly the philosophy of a planned economy and of Government control of production, trade, and exchange, which is espoused by Socialist and totalitarian states. Congress refused to act on the bill seeking authorization for United States participation in an ITO under the Habana contract. In December 1950 the Department of State officially dropped the subject of the Habana charter.

But that was not the end of chapter VI (intergovernmental commodity agreements). A little seed had quietly and promptly been planted into the fertile soil of the cavernous United Nations Organization by the group of Government representatives at the very first meeting in London 1946, to prepare the birth of the charter for an ITO. They created the Interim Coordinating Committee on International Commodity Arrangements (the ICCICA) which is a division of the Department of Economics in the Secretariat of the United Nations.

In January 1951 under circumstances which have been fully reported by the league, the International Materials Conference was created by three governments, including our own. With apparently no clear legislative authority, the executive branch of our Government proceeded to tie itself to this group and ordered the Defense Production Administration to tailor our national policies to the recommendations of that intergovernmental body.

In November 1951 five experts, appointed by the Economic and Social Council of the United Nations, reported and made recommendations on measures for international stability. An American was chairman of that special committee. Among their recommendations for permanent international economic stability was a strong plea in favor of international commodity arrangements. To implement this recommendation, they did not believe any new international agency was required because of the existence of the ICCICA and the IMC.

And now the Paley report (report to the President by the President's Materials Policy Commission) issued in June 1952 makes the creation of these intergovernmental commodity agreements (ch. VI of the Habana charter) a major recommendation in its chapter 15 entitled, "Reducing market instability."

We shall without doubt be hearing more on this subject in the months to come and it is timely for the League members to express an opinion. In general, we believe that such intergovernmental cartels which tend to freeze the pattern of production, prices, and distribution, do more harm than good, will retard rather than assist in the economic development of the world. We do not think that any controls which freeze the pulsation of life out of economic patterns do anything but delay and thereby exaggerate the effects of natural trends. But

we recognize that, under very special circumstances, even outside of total war, conditions might arise where international cooperation and understanding could help over a temporary hump. If such exceptional circumstances should arise, we contend that the intentions to enter into negotiations with foreign countries should be of public record, that our country's participation should be subject to authorization by legislation in Congress after full public hearings, and that the arrangements be surrounded by proper safeguards against permanency or abuse which might upset our private enterprise system. Our resolution contains a paragraph on this subject.

There is one subject I have not touched on because it is a delicate one which will be covered by an expert, our guest speaker of today. It concerns the difficult question of the balance which must be reached in our economy between those who work under the ruthless laws of the universe, of nature, our agriculture, and those who operate under the more stable economy of industrial production.

That concludes my part in this program.

RESOLUTION

Be it resolved by the American Tariff League, Inc., at its annual meeting, October 22, 1952, That the following statements of position shall constitute the basis for its educational program and legislative and administrative recommendations for 1953:

7. The United States should not, except in pursuance of a treaty formally ratified by Congress, enter into, or implement by domestic action, any international plan whereby raw materials or commodities are produced, imported, exported, priced, or consumed by apportionment among countries or peoples.

[From the New York Herald Tribune, October 26, 1952]

FREEDOM'S RESOURCES: RAW MATERIALS NEED IS VIEWED AS A STRONG FORCE FOR PROGRESS

PALEY POINTS TO NEED FOR MUTUAL HELP

(The address at the second session by William S. Paley, chairman, Columbia Broadcasting System, and former Chairman, Materials Policy Commission, on freedom's resources:)

Even in this year of political disagreements, I believe all of us can still agree on certain political and economic goals. We all want peace. We all want prosperity. And we want these things for our friends throughout the free world as well as for ourselves because this is the path of enlightened self-interest. We know that the way toward these goals is widespread economic development, both to raise national incomes and to generate the will and material strength to protect our freedoms.

But one problem creates particular obstacles. The supply of low-cost raw materials is not keeping up with the growth of our economies.

Nations cannot manufacture the products people need and want unless they have an ample supply of the iron and coal, the lead and timber, the copper and oil that supply and fuel their factories. This materials problem bears down with special force on industrial nations like the United States.

As a nation we have prospered mightily without serious concern for our materials resources. Our sensational progress in production and consumption can be attributed not only to the freedom of our institutions and the enterprise of our people but also to our free-handed use of natural resources.

DEFICIT NATION

We have become the supreme advocate of the idea that man and his labor are the most valuable of all and that inanimate materials should be used as fully as possible to give men the greatest return for their labor. This still is and should be our goal. Success in this effort has made us a rich and powerful nation—but the consumption of materials in the process has changed us from a surplus to a deficit nation.

In 1900, we were able to export a net surplus equal to 15 percent by value of the raw materials we consumed, exclusive of food. In 1950, we had to import

9 percent to supply our deficit. And this is not a temporary situation. By 1975, we will want to import three times as much as in 1950.

Our increasing dependence on imports does not mean we are running out of materials. In many cases, we are producing more than ever before, but our factories are chewing up materials at an ever-increasing rate, and there are indications that the real cost of producing them is going up.

By rising real costs, I do not mean the inflation of prices and wages we have experienced in recent years. I mean the costs in terms of the man-hours and capital needed to produce a pound of materials or a unit of energy. As costs rise in these terms, they soak up productive efforts that otherwise could turn out things of greater value. And that cuts down the size of national production and the rate of economic growth.

The President's Materials Policy Commission on which I was working estimated that our economic growth in the next 25 years should result in doubling our total production. This would mean that by 1975 we would have a total national product of $556 billion in terms of present dollars. For our neighbors in other lands growth should take place at about the same or a higher rate.

It is not just humanitarianism to talk about wanting other nations to match or better our growth. It is sound business and political sense. Not only because countries that are better off provide better markets, but because it is to our advantage for them to have a bigger stake in the future—the free future.

Some people may consider this a materialistic approach to what is primarily a spiritual battle. I cannot see how the two can be separated. The United States is throwing both spiritual and material strength into the task of keeping alive the spirit of man and helping to beat back the threat of a new dark age. In turning back this Communist threat, spiritual values probably will count most, but they must be supported by an adequate material base.

We need only to read the statements from the recent Communist Party Congress in Moscow to understand how Russia plans to use the materials problem to her advantage. Soviet nations already are offering badly needed materials at low prices as bait to lure our allies and friends away from us.

The struggle to build an ample materials base for the United States and the free world was the focus of the studies of our Materials Commission for 17 months. We made 78 specific recommendations to carry out 3 general courses of action we believe will strengthen our position. The first two courses deal with improving domestic supplies and making better use of what we have.

It is on the third course that I want to concentrate tonight, both because of its importance to us and to other nations, and because it is closely related to the theme of this forum. The third way is by increasing free world production of materials, and importing more on terms that are advantageous to producers and to consumers alike.

Some people in the United States feel that our rising dependence on imports is a threatening and even a disastrous development. Some people in the countries from which we want to import think that their dependence on exports is a threatening and disastrous development.

But if these viewpoints were to prevail, the nations of the free world, singly and together, would develop a hardening of the economic arteries that would do more to satisfy Mr. Stalin's hopes about the division and economic collapse of the free world than anything else I can possibly imagine.

Many countries in the Americas, in Africa, Asia, and the Middle East have rich resources, but they lie idle because these countries often lack the capital and the skills to develop them. The heavily industrial countries are hungry for these materials and have both skills and surplus capital to produce them.

The process of matching asset to need, and need to asset, could enrich both the underdeveloped resource countries and the industrial nations and improve conditions of life for millions of people. It is a prospect that is nothing less than dazzling in its promise.

MANMADE OBSTACLES

It would seem that the free world would embrace this opportunity. Instead we find manmade obstacles that are great, and I must add, discouraging.

Many less developed nations are afraid and resentful of having their economies dependent on raw material exports. They find that a livelihood based on one or a few commodities is a precarious matter. Even minor fluctuations in the prices of those commodities can hurt, and such prices have soared 90 to 100 percent and then plunged 40 to 50 percent, all in the span of a year or two.

Moreover, to their minds, an economy based on materials exports bears a stigma of colonialism, and the days when their natural treasure was exploited for the enrichment of another country, and when industrialization was discouraged and hindered. Nationalism is on the march among these nations, and their slogan is "industrialize." For some this means headlong industrialization at almost any cost.

While this ambition is understandable, it is based on a fallacy. A concentration on industrialization is not an automatic "open sesame" to riches, or even to economic growth. It can easily lead to slower and less sound general development, back-breaking debts, the loss of trade and the diversion of foreign exchange to make good on food deficit. A surer path is a balanced development of raw materials and food production, and of manufacturing.

It was by such a balance that the United States built its economy—selling surplus materials and food, importing foreign capital, and building industries as capital accumulated. Venezuela, among other nations, is following this path now and plowing back the profits from materials exports to gain social and industrial benefits.

NO OTHER WAY IN SIGHT

It is hard to figure any other way in which the less developed countries can push their way upward.

The day-by-day news on what resource countries are doing about their problems and this great opportunity is far from reassuring. We hear of conflicts over oil; new nationalization of resources, and threats of more; restrictions on exports and currency; limitations on investors' management of their business and on their profits. These nations in general are acting as though they did not need to import capital and skills—and instead actually wanted to cripple and drive out what they already have.

Nor are industrial nations behaving much more sensibly in many respects. Some, in making their bargains, continue to disregard the hopes and aspirations of resource countries. And in the United States we act as though we still were a surplus country. We are clogging the channels of trade by imposing tariffs on raw materials that have little relation to their scarcity in this country. And under the "Buy American" acts, the Government buys domestic materials even when they cost 25 percent more than if we bought them abroad.

Indeed, economic arrangements between industrial and resource nations almost seem to be inspired by a subconscious compulsion toward suicide.

What actually is happening, of course, is that each country, and special groups within each country, are thinking in terms of the advantages and disadvantages of the moment, and forgetting or ignoring not only the world's problem, but also the long-range interest of their own total economy for the years ahead.

REMEDIES SUGGESTED

Resource countries will have to wake up to the basic importance of resource exports to their long-range development, and work consistently toward providing stable and equitable terms that invite investors rather than drive them away. Industrial nations will have to focus on permanent rather than immediate advantage, bargain with more realism in terms of their future interest, and recognize in deeds as well as words the just claims of resource nations to diversified economies.

Clearly the United States cannot control the economic decisions of other resource and industrial nations, but it can exert strong leadership, and give concrete and constructive recognition to the fact that industrial and resource nations need each other. The United States should improve inducements and incentives for our private investors to undertake materials development in foreign countries by negotiating investment and tax treaties and resource agreements with those countries, and by providing a more favorable domestic tax structure for foreign investment.

We should join in aggressive international action against barriers to world trade—and lower our own. We should explore with producers and consumers alike what can be done to lessen the damage done by boom-and-bust cycles of world commodity prices. We should continue and increase our technical aid and assistance to underdeveloped areas. In point 4 work as well as in loans by the International Bank and our own Export-Import Bank greater emphasis should be placed on those services and facilities which will best promote material development.

PATH OF SELF-RESPECT

None of these devices should be regarded as a giveaway program as long as their operation is practical and businesslike in concept and administration. This is the path of self-respect both for us and our friends. By these steps the United States will not only help the free world's economy to grow stronger, and help draw nations closer together, but it will be taking positive measures to counteract the latest economic attack of the Kremlin.

The mutual dependence of the free world—the assets and needs of the less developed resource countries, and the needs and abilities of the industrial nations—can be used for good or for ill. If nations bicker and maneuver in order to use it for immediate advantage, we will weaken ourselves and strengthen our enemies. If we work together for our common long-term interests, this mutual dependence will become a tool—I might almost say a God-given tool—for bringing prosperity where it is lacking, for increasing prosperity where it exists, and for insuring the freedom of all.

WHO IS WHO AT THE FORUM: WILLIAM S. PALEY

William S. Paley, Chairman of Columbia Broadcasting System and of the President's Materials Policy Commission, was one of radio's original "wonder boys." Born 51 years ago in Chicago, was graduated from University of Pennsylvania's Wharton School of Finance, spent 6 years as production and advertising manager of his father's Congress Cigar Co., and in 1928 bought controlling interest in a then-weak radio chain, Columbia Broadcasting System, Inc.

Spent money on prestige programs such as Philharmonic Symphony, international and educational programs, talked advertisers into shortening commercials, and stars into coming to his network. Holds decorations from French, Italian, Polish, Chinese, Cuban, and Dominican Governments, and has been decorated with Legion of Merit Medal for Merit. Served with OWI and as colonel with SHAEF in World War II.

Is a trustee of Columbia University and director of Museum of Modern Art and Philharmonic Symphony Society of New York. He and his wife have four children. Hobbies include golf, tennis, and collecting sporting prints.

DEFENSE MATERIALS PROCUREMENT AGENCY, WASHINGTON, D. C., FOR IMMEDIATE RELEASE, FRIDAY, OCTOBER 31, 1952—DMPA–79

Jess Larson, Administrator of the Defense Materials Procurement Agency, said today that he was gravely concerned about the number of lead and zinc mines that have been forced to shut down in recent weeks because of the declines in prices being offered for the two strategic metals.

Mr. Larson said that a considerable number of marginal mines had already shut down. In view of present high-operating costs, additional cutbacks in production are inevitable unless there is a substantial increase in prices of lead and zinc in the very near future, Mr. Larson declared.

"The freeing of the London lead market and reports that the British Government contemplates removing its controls over the zinc market about the first of the year have had the effect of creating an artificial surplus of the two metals," Mr. Larson said.

"Actually," he asserted, "there is no surplus of production. On the contrary, unless production of both lead and zinc can be maintained at the level that prevailed prior to the recent price declines, serious shortages are almost certain to develop next year.

"The Government's lead program calls for an expansion of only 2 percent by 1955 and the zinc program for an expansion of only 15 percent by 1955. These goals were based on the firmest possible estimates of future requirements of the defense program and our domestic needs. Obviously we will be confronted with serious shortages if the production contemplated in these programs is substantially reduced for any considerable period of time.

"I have received many inquiries as to what plans the Government has for dealing with this situation. There is great concern throughout the domestic industry, and I share that concern.

"On the basis of all available evidence, the present price situation is of a temporary nature. I am sure that actual demand will catch up with the artificial surplus in the near future.

"At the same time, the Defense Materials Procurement Agency is giving the closest study to the situation. We are exploring every avenue for a possible solution. It is my hope that the situation will right itself in the near future. If it does not, every possible remedial measure will be taken to assure production of needed supplies of lead and zinc for the defense program and necessary civilian use."

[From the Detroiter, published weekly by the Board of Commerce, November 17, 1952]

WATER NEEDS GOVERN INDUSTRIAL GROWTH

Modern industry needs water in vast quantities. It uses water for steam generation; for washing, cooling, and conveying; for the disposition and dilution of most manmade wastes, and as an actual ingredient of manufactured products. According to the President's Materials Policy (Paley) Commission's report, industries in the United States used about 80 billion gallons of water daily in 1950, or 8 times as much as in 1900. This Commission estimates that, by 1975, industry will require 215 billion gallons per day, 2½ times as much as is used today.

As examples of the use of water in manufacturing, the Paley Commission cited industry studies estimating that 1,050 gallons of water are needed to produce a barrel of aviation gasoline; 15,800 gallons for a barrel of synthetic gasoline; 80,000 to 100,000 gallons for a ton of rolled steel; 24,000 to 34,000 gallons for a ton of refined beet sugar; 64,000 to 70,000 gallons for a ton of sulfate pulping; and 180,000 to 200,000 gallons for a ton of viscose rayon.

Nonindustrial use of water is expected to increase from 88 billion gallons per day in 1950 for irrigation and 17 billion gallons per day for municipal and rural use (one-half of which is used industrially) to 110 billion and 25 billion, respectively, in 1975. These figures indicate gains of 170, 25, and 50 percent, respectively, for direct industrial, irrigation, and municipal use between 1950 and 1975. Total water use in 1975 is estimated at 350 billion gallons per day or nearly twice the 185 billion figure of 1950.

The impact of this increase on the selection of future industrial plant sites in a Nation already short of water in many areas will be tremendous. The conclusion by the Paley Commission that "by 1975, access to good water may become the most important factor in deciding where to locate industries," seems well founded.

Average flow of the Detroit River is 114 billion gallons per day or nearly two-thirds of the amount of water used in the entire United States. During 1950, daily use of water in the Detroit area averaged 2.949 billion gallons, of which about 2.5 billion were raw water taken from the Detroit River by industry, used, and immediately returned to the river.

According to the United States Geological Survey, "Lake St. Clair and the Detroit River are unusual as sources of water supply because they are subject to much less variation in quantity and quality than most other streams and lakes outside of the Great Lakes system. These sources alone provide a potential water supply of good quality that is far in excess of the foreseeable needs of the Detroit area." Detroit's virtually unlimited supply of pure water will be an increasingly important factor in attracting industry to this area.—*John R. Stewart.*

[From the Harvard Business Review, November–December 1952]

The recent five-volume report of the President's Materials Policy Commission is the subject of discussion in Thinking Ahead, written by George S. Brady, industrial materials consultant in Washington, D. C. Mr. Brady sees in the report a very significant contribution for purposes of developing a coordinated national effort to assure an adequate and dependable flow of world materials at equitable prices. His object here is to focus attention on some of the important parts of the report which were overlooked in the round of newspaper publicity following its publication, and the result is a shrewd analysis of the raw materials outlook for many years to come.

THINKING AHEAD

Being asked to analyze the report of the President's Materials Policy Commission, I read the five volumes and formed some opinions which, after more

careful study, are only strengthened. However imperfect the report may be, I could see in it, at last, the beginning of a new science of materials economics. In spite of all the good that has been accomplished by the various technical-administrative agencies of the Government, none of the regular agencies over the years has ever been able to coordinate its efforts with all others and bring forth programs which would lead to our needed goal of an adequate and dependable flow of world materials at prices that would be equitable to both buyer and seller and assure equity to the producing nations.

I do not say that the report furnishes the answers. But I do believe that the report has set the foundations for a procedure, if it can be followed through with action. But, after a round of newspaper publicity, mostly accenting only one small part relating to metal shortages, public interest in the report seems to have died down. Will it follow the course of most Government reports and sink into silent death, or will something be done on the executive level toward attaining the coordination of forward-looking plans for conservation, for the utilization of the immense resources that are now considered too low grade for commercial use, and for a more progressive relationship with foreign nations in the exchange of needed materials?

The Commission recognized that, because of the great scope and complexity of the task, the report could be offered only as a beginning. It believes that the work should be carried on continuously. A natural answer to that might be that every Government temporary commission always seeks to perpetuate itself, and that the economic study, development, and conservation of our natural resources are already provided for in the basic legal tasks assigned to the Departments of Interior, Commerce, and Agriculture. But, opposed to this view, are the facts that these regular agencies have never been able to coordinate their piecemeal works and that they have defaulted on many important tasks charged to them under the basic laws.

Although severe conservation measures have often been placed over birds, fisheries, and other wildlife, practically no control has been exercised over the utilization of our mineral resources, though it is plainly evident that Congress had no intention of limiting its commands to wildlife. Our mining laws stem from the 19th century era of pistol-packing staking, and they compare unfavorably with those of even backward and colonial countries. We are stripping our forests 40 percent faster than they are growing, and we have now entered a period where greatly increasing inroads are being made into the timber of our public lands.

While the Department of the Interior has too often failed to promote the utilization and conservation of national resources as charged in its basic law, what has happened in the Department of Commerce is a more complete departure from the original intent. In the basic law setting up the Department of Commerce, the Bureau of Foreign and Domestic Commerce is charged with the duty to foster, promote, and develop the foreign and domestic commerce of the United States, make investigation of requirements, sources of supply, production capacity, procurement, and problems of commodity supply. But, in the past two decades, a mushrooming growth of economic bureaus in the State Department has stripped these functions from the Department of Commerce and interwoven them with the secrecy and chicanery of political diplomacy, leaving the Bureau of Foreign and Domestic Commerce as a skeletonized nonentity.

The Commission, naturally, does not speak of these things directly, but it is evident that it is aware of them, and believes that the coordination of the materials economy of this Nation can be handled only by an independent administrative agency free from diplomatic secrecy and with the courage to promote control and conservation of our natural resources in the public interest, even where such controls conflict with the interests of pressure groups.

The figure given in the report for the consumption of all raw materials for the year 1950, namely, 2.7 billion tons, appears to be low. Certainly, it does not give a true indication of the enormous tonnage hauled by rail and truck. The figure of 390 million tons given for the total consumption of metallic ores is an underestimate. Few people realize the stupendous digging and hauling problem involved in our metal-mining operations, although this problem presents us with serious labor and transportation tasks during national emergencies.

Copper is a relatively low-tonnage metal; yet, in 1950, the average copper content of ore mined in the United States was less than 1 percent, so that 110 tons of ore had to be processed to produce 1 ton of metal. In the removal from

the mine, the proportion of good ore to waste rock runs about 50–50, which means that 220 tons had to be dug and hauled for 1 ton of copper. And this figure does not consider the overburden which is sometimes very great. At 1 mine, 50 million tons of rock overburden had to be stripped off and hauled out to expose 200 million tons of ore body.

In the case of some other lower tonnage metals, the Commission may have been led astray by the fact that tabulated figures are usually given in metal in concentrates, and they give no indication of the enormous tonnages of crude ore and waste rock that must be mined and hauled.

Much could be written in an expansion of the ideas expressed in the short chapter on "The Opportunities." In accenting other parts of the report, newsmen overlooked this chapter in which it is evident that the Commission was well aware that our domestic resources are far from being exhausted if we take steps to devise methods that will utilize all the metals in the ores, eliminate wastes in present commercial mining, and learn to utilize the ores which we now call low grade. These ores are low grade only because it is costly to extract the metals by the old metallurgical processes. Immediately after World War II, the Bureau of Mines was urged to get behind the new chemical processing, but metallurgically trained men have been slow to see the great production possibilities that lie ahead in the use of chemical methods, and it has been the chemical companies, hitherto not producers of metals, who have had to pioneer in this field. By chemical methods, all of the various metals in a mineral can be extracted, not merely the one metal that designates it as an ore.

The Commission report gets out of form and picks up the fear phobia of the Penatgonians in the chapter on New Weapons Use More Materials. After showing that we need more and larger aircraft, heavier tanks, and a greater supply of all kinds of weapons, the report goes on to say that our allies would be increasing their demands at the same time, thus limiting our supplies from foreign countries; that domestic facilities might be bombed; that free countries might be subverted or invaded; and that enemy action might sink cargoes. Reading it, one gets the feeling that it might not rain for 6 months and then all the rivers and lakes would dry up and we would die off anyway. It is good tactics to anticipate difficulties and prepare to avoid them, but to dwell on and exaggerate difficulties until one is beset by a morbid fear is a sad state of mind.

This particular chapter of the report seems to have been written by someone already immersed in the claustrophobia of our stockpile program that has resulted in piling up huge backdoor stocks and has neglected the development of new ways of getting more domestic materials and better ways for assuring a steady flow from the free countries in wartime, not to speak of a confession to the enemy that we are afraid that we cannot help other free nations to maintain their economies during a war.

Certainly this section of the report should be discontinued in favor of other sections that accent more progressive means for meeting the situation technically and administratively. Turning to page 21 of the report, we see an expression that is more in line with the American spirit of Bunker Hill and Chateau Thierry: "Neither can public policy be guided by the extreme of pessimism, lest we pay so much for insurance that we have little left for anything else."

After 6 years of fiddling with huge stocks whose upkeep costs are staggering, it is about time that we revamped that bureaucracy and let the enemy know that we are determined to maintain our trade with other free nations. In 1942, during World War II, when the domestic-mining industry asked for the release of soldiers so that domestic-metal production could be increased, the Army refused the exemptions with the statement that a plentiful supply of labor was available in other friendly nations, that those nations needed to produce in order to maintain their economy, and that the Navy was perfectly capable of guarding the overseas supply lines. This is something to remember for the future.

The report points out that industrial designers should aim to call for the use of a proportionately greater quantity of those materials which are most plentiful in nature, and thus conserve materials which are naturally scarce. This theory conforms with the practical experience of the National Production Authority during the recent Korean emergency. It was found that many of the uses of nickel had been prodigal, and that the same production of civilian products could be obtained with less than 50 percent of the former amount of nickel without appreciable deterioration of the quality of the products.

In the case of copper, it became strikingly evident that many products customarily made of brass could be made just as well, and often better or more economically, from more plentiful materials. Where the copper was used in items that were never returned as scrap and the metal was lost forever, such as lead-pencil ferrules and cosmetic containers, Government authorities favored industrywide changes to the more plentiful aluminum. The use of brass for ferrules had merely become an accepted custom, and one company naturally did not wish to change unless the others did likewise. These substitutions of aluminum for brass were not received with joy by producers who saw their old historic patterns of trade being disrupted, but some brass producers with vision to see the inevitable trend of progress extended their operations to include aluminum.

The section of the report dealing with prices is an example of skillful hedging, but it contains much food for thought and action for anyone with vigor enough to strip off the doubts and indecisions and take a chance at being positive. The Commission recognizes that the upward thrust of materials prices after 1940 was not entirely due to cost increases, but rather to the fact that supply was below demand. In metal mining, the wage increases have often been more than offset by the technological improvements that have greatly increased the production per labor-hour.

What the Commission does not point out, obviously to avoid a political clash, is the manifest injustice of the Government's attitude toward metal prices compared with agricultural prices. Even greater technological improvements have come about in the production of many farm materials, as is shown by the Commission's charts; yet, while metal prices were held down rigidly by the Government, the farmer was given a price that netted him "parity" or equal buying power with the dollar of 1910–14. Thus, under the thinking applied to wheat or cotton, a copper price of 19 cents is less than 50 percent of "parity." However, the Commission does show that the substitution of aluminum, plastics, and other materials has tended to hold down the price of copper, while there is no real substitute for wheat where the parity zealots have monopoly control. Cotton on the other hand, is being driven to a secondary place by its high parity price in relation to substitute synthetics.

While the Commission believes in strengthening our domestic resource supplies, it definitely does not agree with a policy of domestic self-sufficiency and reliance on hoarding of those materials which come from foreign sources. A continuing balanced economy for all the free nations, as well as for ourselves, is recognized as a necessity for a peaceful world.

Neither does the Commission believe in a hair-shirt concept of conservation. It does not believe that apparent physical waste always means economic waste; it does not feel that it is good economics to spend dollars' worth of labor and time to save a few cents' worth of materials, as is so often done in continental Europe. In general, it seems to agree with those who have been on the inside of the experience of the past 2 years and who are convinced that the United States would make a mistake if it planned a war economy on an austerity basis, forbidding the production of civilian items, using materials only to manufacture military goods. These people believe that our strength against numerically superior hordes will lie in the "American system," and that the American soldier would not be the superior soldier that he is if he and his family were deprived arbitrarily of the things that make up the American way of life.

The report rightly judges that conservation of materials is an intricate problem that requires supervision by technically informed people with ability to override the hindrances of pressure groups. This is implied in many parts of the text. Substitution is not something that pertains only to emergency times; it occurs daily in the design of the products of industry, as one material is found to be cheaper or more workable. Where Government can help in an emergency is to coordinate the efforts, so that the savings of scarce materials can be put on an industrywide basis for a greater overall savings. In emergency times such as the present, the Government is the major purchaser and user of materials, and its influence is of importance over and above the power of controls.

The wastes in the original production of materials are often greater in tonnage than the amounts that can be saved by substitutions but have escaped the normal process of substitution by price competition. The report points out that 10 percent of the copper in ores is left in the tailings heap, and that 50 percent of the coal in the mine and more than 50 percent of the petroleum in the average pool are left in the ground. More than 40 percent of the wood in a tree is wasted in average lumbering. Eventually, these wastes are narrowed as the industries are

able to devise means of extraction that will be commercially profitable. But in an emergency, when demand exceeds normal production, it may be necessary for the Government to step in with public funds to aid in increasing supplies from these noncommercial sources.

During World War II, Government aid to the nonferrous metals industry was not too successful, but, on the other hand, the operations of the rubber agency, though highly costly, resulted in an unprecedented quickening of the pace of technical development, as well as great gains in production, of synthetic rubber. These two cases only show that Government participation in these problems should be tailored to fit the conditions of the individual matrials, and that the programs of coordination should be open enough and flexible enough to permit changes as the difficulties arise.

The basic difference between the programs for nonferrous mining and synthetic rubber was that the metals program was a fixed act of Congress covering a single method to be operated by the sponsors who had no interest in any other method, while the rubber program was a general act that left the operating agency free to coordinate with industry for a progressive advance of the program toward the goal.

In a discussion of costs, the report states that nature stacked the cards against us by the wide and varied distribution of natural resources. This is something to think about in these days when we are striving to attain a brotherhood of man and some form of united nations. This very unequal distribution of natural resources seems to have been a deliberate plan of the Creator to force men to a realization that all men and all nations are interdependent and that they must learn to cooperate for the proper utilization of these resources. As our technical civilization has become more complicated, this interdependence of nations and the necessity for a materials trade that will be equitable to all has become more strikingly apparent. It will find no solution in 19th century striped-pants diplomacy.

The Commission believes that, even though by 1975 we increase greatly our capacity to produce more domestic materials, our need to import will also increase. This is undoubtedly true. The last generation saw us turn from being a surplus nation in copper to a large importer of copper, and this generation now sees us becoming dependent upon foreign nations for iron ore. We need also many tropical materials that we can never produce in this country, and which we may not be able to replace by synthetic as we did with rubber.

When one gets into the sections of the report that have detailed studies of key commodities, he sees a prevailing atmosphere quite different from that of the general basic part of the report. The studies on iron and steel and on other metals more nearly resemble the line of commodity reports that flow from the regular Government agencies. The same old nuts are cracked in the same old ways, and the same old economic theories and prejudices are exploited. Somehow these commodity studies do not belong with the basic Commission report; they were apparently ground out in the regular maws of the bureaus.

In discussing iron and steel, the gong is sounded for more scrap and more intensive scrap drives. The freshness of viewpoint that enlivened the basic part of the report is absent, and the question is not asked whether more modern methods might require less dependence of our great steel industry on the junk dealer. The steel reviewer also believes that we should extend financial aid for the production of steel in the underdeveloped areas of the world. It is the old war cry of those who have already extended so much aid that our steel export trade is being killed off.

In the case of manganese, the report follows the propaganda of the big stockpile advocates in the defeatism that "in the event of war, it is quite possible that the United States might be substantially cut off from present sources." This is childish nonsense because, during World War II, we were able to import more manganese than ever before; and since then we have aided in the development of more readily accessible foreign resources from which it would be more economic to ship than from a stockpile. It would not be in the interests of a free-world balanced economy to revert to a stockpile and close these mining facilities in wartime.

The report estimates that the demand for copper by 1975 will be 45 percent greater than in 1950. There are really no bases of experience for this 25-year advance estimate, because past experience is not comparable. It will take several years more of experience with aluminum, magnesium, and plastics to indicate the true trends. As to supply, while it is true that most known deposits capable of being worked by present commercial methods are already in full production

(as stated in the report), our short experience with chemical methods of extraction has indicated that copper lends itself most easily to chemical extraction even from ores where copper is only a minor byproduct. If designers learn to use aluminum, plastics, and other alternate materials for products where the peculiar characteristics of copper are not really needed, there is no reason to feel that there will not be a sufficient supply of copper for all essential needs for the foreseeable future. Fully 60 percent of all the copper used in products eventually gets back to the mills as scrap, and if more care is employed to use more plentiful materials instead of copper for products that do not return as scrap, this percentage will be increased.

The estimates of depletion of our reserves of lead and zinc within a few years have been stuck up as scarecrows for so long a time that little credence can be placed in them, and the Commission recognizes this fact. About 85 percent of the lead used for storage batteries returns as scrap, and 90 percent of that used for cable coverings is eventually recovered. The biggest demand for zinc has been for galvanizing, and alternate materials for galvanized steel are rapidly making this use smaller. Recent new discoveries of lead and zinc ores in neighboring countries, completely out of range of the phantasm of enemy submarines that so terrorize some bureaucrats, point to the practical elimination of lead and zinc from the lists of shortage materials.

Tin, however, is a material on which the most careful forward planning will have to be done. The problem involves better relations with Bolivia, the guarding of Malaya and Indonesia with our lifeblood if necessary, an an even better conservation program than we have yet had. But it is not possible to agree with the Commission that "there is little likelihood of discovering any significant new deposits." The geological formation of certain parts of Canada indicates than there should be tin there, and tests already made justify this conclusion.

To write any short summary of the Commission report is clearly impractical. In a general sense the report is overwhelmingly cast because it embraces the whole subject of materials economy. One can find many details of the report to criticize, but it is safe to say that it is the nearest approach to attaining the beginning of a coordinated effort that has yet been accomplished.

Each chapter of the report furnishes meaty ideas that need much expansion, discussion, and action, and the Commission has wisely recognized this and not attempted to supply dogmatic answers. No single man or group of men can answer the problems offhand. The development of correct answers will require continuous work over the years; the report is merely a start.

I agree with the Commission that "the time has clearly passed when we can afford the luxury of viewing our resources as unlimited and, hence, taking them for granted." I would add to this that the time has come when we can no longer leave the production and trade in world raw materials entirely to the chances and vagaries of a price economy—GEORGE S. BRADY.

[From Engineering and Mining Journal, December 1952]

WHAT THE PALEY REPORT MEANS TO UNITED STATES MINERS

Knowing the Washington scene, from experience, nearly as well as he knows mining, Mr. Herres draws on both backgrounds to present his analysis of the report that is still agitating councils of mining men everywhere. It has some good points, he says, but also some faults you may have overlooked.

Otto Herres, vice president, Combined Metals Reduction Co., Salt Lake City, Utah

The President's Materials Policy Commission has attempted to outline the main features of the materials problems of the United States of America and the world, as it sees them, on the basis of the record for the year 1950 and its estimates covering the next 25 years. The conclusion reached is that there are no purely domestic materials problems, but only domestic aspects of world problems; these probably have no final solutions and may be compensated only by the ingenuity of mankind.

SELF-SUFFICIENCY REJECTED

However its thinking may be on that point, the Commission has recommended certain policies and programs which it believes will provide solutions to the materials problems, or at least will do much to alleviate threatened shortages

and to stimulate economic growth and promote free-world security. The major premise upon which all of the rest of its report is based is the belief of the Commission that the United States must reject self-sufficiency as a policy and instead go for the lowest-cost acquisition of materials wherever secure supplies may be found. To reach this conclusion, the Commission proceeds on the assumption that things will continue much as they are.

Because the economy is running high, apparently it will continue to run high; for the reason that international tension exists, there will not be any sudden end to the tensions; nor will there be any specific changes in the present world political alinement, according to the Commission's reasoning.

Recent years have seen shortages of materials and full employment. Consequently the Commission assumes our economy may be expected to follow much the same pattern of shortages and full employment for the next quarter century. Its concept of full employment and a world solution of the materials problem seems to be based on the assumption that Government planners can regulate production better than a free market and the law of supply and demand. The report indicates a high regard for the promise of technology, but makes comparatively little use of it as a factor in its projections of individual materials and energy sources.

The policies and programs recommended by the Commission are concerned with ways of stabilizing supplies and prices of commodities on a global scale by means of world agreements on production and distribution of raw materials, the establishment of international stockpiles, and particularly the elimination of import duties, especially on metals and minerals. The Commission strongly favors Government assistance, financial and otherwise, to promote foreign investments directed toward the expansion of foreign materials production.

The Paley report offers a valuable fund of information relating to key commodities and energy sources. In the five volumes the mining industry will find a useful compilation of facts concerning its products and problems.

RESEARCH AND EXPLORATION

The Commission has made a very real contribution by emphasizing the importance of research and exploration work, both in this country and abroad, and the great opportunities for further progress. American industry is fully aware of this vital need and has done much to extend our industrial horizons. With proper encouragement, greater progress lies ahead. Already the accomplishments of science and technology under a system permitting individual freedom have brought to American workers the most pay and the highest living standards in the world. Consideration of these accomplishments and of prospective tasks and opportunities possibly will serve somewhat to clear up the delusion that all betterment of the individual has come about from the activities of politicians and labor leaders.

TAX INCENTIVES

Recognition is given by the Commission to the effectiveness of tax incentives in stimulating the discovery and development of new sources of essential raw materials. In contrast to other forms of Government aid recommended in the Paley report, the use of tax incentives does not involve interference with private initiative and management by Government agencies. The report indicates that attacks in Congress on depletion allowances by the Treasury Department and others are shortsighted and ill advised. The experience of the petroleum industry is cited to show that tax incentives serve to stimulate the discovery and development of new reserves of essential materials. Rather than drop tax incentives, Congress should study ways of broadening the use of this means of encouraging progress in fields other than petroleum, according to the Commission's findings.

The Commission has recommended specific programs for the aid and assistance of the domestic mining industry. Of far greater importance in their ultimate effect on the industry, however, are the principles and policies laid down in the report. No particular program can be considered intelligently without examining the policies and objectives upon which it is based. For this reason thought must be given to the major premise of the report, and the assumptions and beliefs enumerated by the Commission and its staff, before going into individual recommendations.

The Commission looked at conditions in the year 1950 and saw full employment in the United States, a world shortage of raw materials, international tensions, and rising prices. Proceeding upon the assumption that this state of affairs is

normal, at least to the extent that the trend may continue relatively unchanged, it foresees developing shortages and rising costs which will endanger the Nation's security and living standards. Concern over rising costs seems fully warranted at this time, but the impact of higher costs on prices and the leveling influence of world competition have a way of relieving shortages.

The remedy for shortages and rising costs, the Commission believes, is low-cost acquisition of commodities in world trade, to be obtained by our investment in the development of foreign resources. The United States must reject ideas of self-sufficiency and eliminate tariffs on raw materials obtained from abroad. Private enterprise is encouraged to do the work, but the fundamental concept involves a mixture of private and public influences on our economy. The Commission, like the Washington planners, believes that the coexistence of great private and public strength in our economy is essential to our preservation.

GOVERNMENT CONTROLS

In the Commission's concept, the Government would exercise more control over raw materials, the lands from which they are produced in this country, and the financing of their production abroad. In cooperation with other governments, there would be world agreement on production and prices, and there would be international stockpiles and commodity pools. Our State Department for years has been endeavoring to gain congressional approval of a charter for an international trade organization authorized to make intergovernmental commodity arrangements covering any agricultural product or mineral which enters world trade in substantial volume. It would seem that there is a striking similarity in the Commission's recommendations and the Department's views.

EXPERIENCE DIFFERS

The experience of the domestic mining industry differs from the Commission's assumptions and beliefs in many respects. In contrast to the Commission's assumption that existing conditions will continue and therefore constitute a reasonable basis for predicting the future, industry has found that nothing is so certain as change. Looking back over the political, industrial, and scientific developments of the last 25 years bears this out. We see atomic energy, electronics, world wars, great advancement in the production of light metals, plastics, synthetic fibers, and revolutionary improvements in forms of communication and transportation, among the drastic changes that are affecting our way of living and our use of materials.

In some respects the domestic mining industry finds the Commission's recommendations inconsistent. The Nation is urged to reject self-sufficiency, but the Commission states: "Despite progressive increase in imports, the Nation still will look to its own reserves for most of its mineral supply." By discovery, beneficiation, or synthesis, the Commission finds that the supply of most of the industrially important minerals may be increased in the United States except chromium, nickel, tin, cobalt, platinum, and mercury. This does not quite agree with the have-not emphasis of the report; there is increased production of cobalt already in prospect in Idaho and Missouri.

SHORTAGES FOREVER?

Nor is it possible to agree entirely with the Commission's views that shortages of raw materials and full employment will continue largely unchanged for the next 25 years. We are in a period which follows 10 years of the great depression, and another 10 years of world war and postwar aggression. Even now Asiatic war goes on, seemingly without end.

There were no shortages of raw materials during the first 10 years of this period until the outbreak of World War II. For the following 10 years and continuing into the present, the shortages and full employment have come about by the demands of war and rearmament, civilian needs deferred because of depression and war, and inflationary spending. Except in times of crisis and emergency, the mining industry in the United States has found surplus production, unstable prices, and competition with materials produced under low foreign living standards to be more of a problem than shortages. No great change is anticipated in this respect unless another world conflict develops.

In fact, the Nation's self-sufficiency seems to be increasing. The ratio of imports to production has fallen in the United States from some 5.2 percent

in 1929 to approximately 3.3 percent in recent years. European nations have come to depend a great deal on food and materials produced in this country and Canada. We have been pursuing a policy of supporting our exports and a gigantic surplus by means of economic aid and gifts to western Europe and to much of the rest of the world that is not under the domination of Soviet Russia. Our participation in world trade rests on high taxes at home and charity abroad, sustained for the time being by inflationary credit and monetary policies.

The conclusion may be true that there are no purely domestic materials problems but only domestic aspects of world problems. Whether or not that is the case, the report makes little mention of the long-term solution of world materials problems which is an end to inflation in this country and the restoration of freely convertible currencies in international trade. Europeans and the British have come to understand that survival for them depends on a noninflationary policy. They must increase their production and the productivity of their industries and obtain more of their food and raw materials in countries outside the United States and Europe. There seems to be no sound alternative. Americans in time probably will come to the realization that they are living again in a competitive world when nations struggling to survive take less of our production and send us more of theirs.

CASE FOR TARIFFS

Other countries look upon the United States as a high-living and a high-cost country, paying wages ranging from double to many times earnings elsewhere. The Paley Commission recommends, but with some qualifications, the elimination of import duty on any industrial material. When a country known to the rest of the world for its high wages, high costs, and high living eliminates import duties, its workers and industries are in competition with lower wages, lower costs, and lower living standards. World prices then are established by competition and the many factors that bring balance to supply and demand. The experience of the mining industry is that world prices in the absence of crisis and emergency demands often tend to drop below the level required for the survival of industries essential to our national security. Then surpluses, rather than the shortages feared by the Commission, cause the closing of American mines and unemployment of high-wage miners.

For example, the State Department last year in Torquay Trade Agreements negotiated a reduction in the tariff on slab zinc to seven-tenths cent per pound. On a zinc price of 14 cents per pound, seven-tenths amounts to 5 percent and is of no great consequence as a barrier to imports. Zinc imports since the first of the year have been heavy despite increasing domestic production. Recently the price broke from 19½ cents a pound to 13½ between June 1 and August 6. That experience is a repetition of what happened in 1949 when the price dropped from 17½ cents on March 23, to 9 cents by June 15. Yet before the end of the year 1950, Government officials were pleading with the domestic industry to expand production because of a critical world shortage of zinc.

The Paley Commission, like the State Department, seems to believe that if producers see tariffs coming down, they can convert in various ways into new and productive occupations. The Commission's recommendations might be extended to tell the mining industry to what it should convert, and where the world would be today if the advice had been followed when tariffs were cut too low in past years.

In fact, experience has taught the domestic mining industry not to place too much confidence in predictions and assumptions such as the Commission's full employment and shortages for the next 25 years.

Not many months ago a Government agency in Washington was saying, "No matter how much requirements may be increased or decreased, there is a shortage of the three basic metals, copper, lead, and zinc, that is not going to be overcome right away." Industry experience indicated otherwise and already surpluses have caused heavy price drops in lead and zinc despite advancing wage scales.

In the Commission's judgment, there are few cases where a protective tariff would be the best device for satisfying security needs of the Nation. The Commission advocates stockpiling, expansible capacity, long-term contracts and similar devices.

STOCKPILE AT HOME

The mining industry has urged consistently the stockpiling of metals and minerals for defense and emergency needs. It is believed, however, that the most efficient and economical procedure is to stockpile when output exceeds demand, and to adjust or suspend stockpiling purchases when critical shortages cause losses and delays to production in defense and essential industries.

The Commission recommends that the "Buy American" provisions in the Stockpile Act should be repealed and support of domestic production, when essential, be accomplished by such other devices as subsidies and price premiums. To industry it seems evident that if the policy is "Buy foreign," the only purpose that subsidies for domestic production would serve would be to build up a surplus and put producers who are not subsidized in competition with the low wages and lower living standards of foreign production. Rather the procedure should be to do what is best for America.

SERVING INDUSTRY

The mining industry has confidence in the Geological Survey and Bureau of Mines and the services provided by the two Federal agencies toward the development of the mineral resources of the United States by private enterprise. It is agreed that these agencies should be strengthened and given additional support as recommended by the Commission, but this should be for activities to serve the mineral industries and not directed toward regulation, control, or competition with private enterprise. Heavy emphasis is recommended by the Commission upon analysis of the minerals position of the United States by professionally trained economists. To this should be added the qualification that professionally trained means that academic learning must be supplemented and seasoned by experience of consequence in industry.

The Commission observed that "We need to map our country more completely so that better than the merely 11 percent which is now geologically described can become more familiar to us." If this is the case, it may be pertinent to ask whether it would not be more in the national interest to devote greater attention to the other 89 percent and a little less to the affairs of our neighbors. If we look into our undeveloped resources, perhaps we may be better off than some agencies of Government would have it appear.

The British have found over the past 50 years that a policy of relying on cheap imports and a near monopoly in most manufactures cannot be sustained in a competitive world troubled with wars, colonial revolutions, and aggression. Survival, as we shall learn in time, depends upon the strength of our economic and industrial structure, self-reliance and ingenuity.

PUBLIC-LAND POLICY

With respect to managing resources on Federal land, the Commission recommends changes in the mining laws. The mining industry is opposed to any change in the laws and believes that abuses and shortcomings in the functioning of the laws can be corrected by better administration and a more cooperative attitude on the part of the Bureau of Land Management toward the mining industry. Leasing as an alternative to the location of mining claims on the public domain is recommended by the Commission and may have some possibilities under certain conditions but perhaps might prove to be only a transition stage that eventually would mean an end to further private ownership of mineral lands.

FINANCIAL INCENTIVES

As to financial incentives in minerals, the Commission recommends the continuation of percentage depletion as a strong inducement to risk capital to enter the mineral industries; also that the present limitations applicable to minerals other than oil and gas on the amount of permitted expensing of exploration cost be removed. It is believed that these recommendations are constructive and that experience will show them to be in the public interest.

For the purpose of encouraging small-scale mining, which has no opportunity to benefit from tax incentives, percentage depletion, or expensing of exploration and development, the Commission recommends incentives in the form of loans up to $100,000 for prospecting purposes. Small mines probably will find the proposal unattractive in many respects, not the least of which might be administrative difficulties and bureaucratic controls.

Industry advice is to the effect that price stability is the best way to bring about expanded domestic mineral production for the long range. This advice has been followed with good results for some of the scarcer minerals mined in relatively small tonnages in this country, such as tungsten and manganese, but not for such important ores as copper, lead, and zinc. A policy of flexible tariff protection would serve the purpose to some degree.

A bonus payable on new production from small mines would encourage the continued operation of prospectors and small mining concerns. The Commission believes that encouragement in some form is important because these smaller operations provide an important pool of trained manpower available for expansion of minerals output in the event of emergency. The output from each mine or prospect that produced at a rate of less than a specified tonnage of metals might be considered new production. In most cases this tonnage is obtained by exploring for an ore deposit having possibilities that can be developed to make a mine of importance. Automatic administration and freedom from bureaucratic controls could be assured by having custom mills and smelters act as fiscal agencies of the Government as is the case in the Silver Purchase Act. A bonus would provide the encouragement the Commission believes desirable for the benefit of the Nation on a broader base than the program of the Defense Minerals Exploration Administration.

FOREIGN AID

In advocating foreign materials development, the Commission recommends government-to-government special resource agreements, United States programs of technical assistance, long-term purchase contracts for foreign-produced materials, Government loans for foreign materials expansion, and Government management contracts for the same purpose.

Although the emphasis of the Commission's report seems to be placed on aid for expansion and production outside of the United States, experience teaches that national security requires a healthy mining industry with ample productive capacity and adequate working forces. To this end it is necessary to afford domestic mines at least the same price and other considerations and advantages given foreign properties by our Government. Otherwise Government competition with its citizens, in the form of the foreign production it would subsidize, could destroy domestic industry.

The Commission believes in international arrangements for stabilizing the materials market, multilateral contract and buffer-stock agreements, either with or without quota provisions on exports or production. In this conclusion the Commission, it seems, supports the ambition of the State Department to attempt planned economy with its bureaucratic controls and regulations on a global scale.

History records the difficulties of attempting market manipulation in international trade. Such efforts at stablization through governmental monopoly control of the unstable world we live in usually end in failure. Perhaps some all-wise government in time may be able to control a competitive world and, by planning the economy, end the struggle for survival, but that Utopia seems as far away as it did 3,000 years ago. Mankind still must work to have economic security, and has to make use of that ingenuity the Commission referred to before it became intrigued with ideas of Government-managed economy.

Industry believes that private international investment on a large scale is the sound course to follow for the development of the natural resources of underdeveloped countries. The efforts of a free and resourceful people are likely to prove more effective than Government bureaus. Government activities give rise to difficulties such as charges by other nations of United States monopoly control of world raw materials, imperialism, and the destruction of individual enterprise, all dangerous to the cause of a more peaceful world.

GLOBAL AMBITIONS

The Commission would have Washington officials, already bewildered with the administration of a Government grown too big for their management capabilities, extend their activities to a global scale. It might be better to leave to industry and private initiative the things that require the ingenuity, knowledge and the training of industry, and confine the activities of Government to the service and protection of its citizens.

[From the Wall Street Journal, December 23, 1952]

MATERIALS POLICY: RESOURCES BOARD DRAFTS MEASURES TO IMPROVE LONG-RANGE UNITED STATES STATUS

By a Wall Street Journal staff reporter

WASHINGTON.—The National Security Resources Board gave the President a batch of recommendations aimed at improving the Nation's long-range power and material supply positions.

The proposals, most of them well worn, range from recommendations for greater freedom for United States firms to participate in atomic energy development to tighter Federal controls on the construction industry.

They are based on a group of 78 formal recommendations made to President Truman last June by the Materials Policy Commission, headed by William S. Paley, chairman of Columbia Broadcasting Co.

The Board reported yesterday on each of the Paley group's recommendations. It rubber stamped most of the important recommendations made by the Commission, but it disagreed on a number of relatively minor points in the areas of forest conservation, tax aids for United States companies investing abroad, and uniform standards in the construction industry.

APPROVED WITHOUT RESERVATION

Seventeen of the most important recommendations made by the Paley group were approved almost without reservation by the National Security Resources Board, and by 22 other Government agencies concerned with materials policy. The National Security Resources Board urged priority treatment for these key proposals, although most of them will require specific congressional approval.

Among the recommendations:

Permit privately owned electric utilities and other firms greater latitude in developing improved methods for generating electricity from nuclear power sources.

Authorize the St. Lawrence seaway and power project without delay.

Enact legislation, independent of the Reciprocal Trade Agreements Act, permitting the President to go as far as he wants to reduce or do away with import duties on those raw materials essential to the Nation's security and are not so plentiful here.

Step up the pace of Federal construction of hydroelectric power projects and multiple-purpose reservoirs on the Columbia, Niagara, and St. Lawrence Rivers.

MINING LAW REVAMP

Revamp laws dealing with mining operations on Federal lands to permit prospectors to lease deposits as well as acquire them under the present system of claims. This proposal is aimed at plugging loopholes in present laws while offering greater incentives for private exploration for and exploitation of mineral lands.

Clamp down on restraint-of-trade abuses in the construction industry, with new amendments to the antitrust laws if necessary.

The future of the Paley recommendations is highly doubtful. Many of them call for stepped-up Government appropriations and tighter Government controls, while the new Congress which must supply the new funds and authority will be dominated by economy-minded Republicans. Furthermore, many recommendations will run into stiff resistance from private industry. Typical of these are the proposals to revamp the laws for mineral exploitation on Federal lands.

At the same time, however, supporters of the Paley policy suggestions will be able to show most of them are aimed directly at bolstering United States security in terms of raw materials. This argument could go far in persuading doubtful lawmakers of their merits, particularly if the international situation should become still more uncertain.

AGREES WITH COMMISSION

The NSRB fully concurred with the Paley commission in urging intensified technical research on methods of locating, extracting, and utilizing materials. In some cases this research would be done by Government agencies like the Na-

tional Science Foundation, while in other cases it would be performed by private firms with Government financial aid.

The board recommended the Government "encourage immediate exploration for oil on publicly owned offshore lands" and that rigid conservation policies be required of companies in extracting oil from these lands in order to maintain an "underground stockpile" of oil for use in a full-scale war. The NSRB said these measures should be taken regardless of whether the next Congress decides to turn the offshore oil lands over to the States.

The NSRB echoed most of the Paley Commission's recommendations for a more aggressive forest-conservation program. The board advised stepped-up appropriations for replanting forest areas, for construction of timberland access roads and for more vigorous action against pests and blights in federally owned forests. The Board also urged more favorable revisions of State timber-cutting laws as well as the creation of Federal forest credit and insurance systems to aid woodland owners in carrying out progressive timber-management policies.

NO COMMENT ON SOURCE

The Resources Board did not comment on a great many "informal suggestions" which appeared in the five-volume Paley report last June.

The Paley group stirred up some controversy at the time when it suggested the Government use multilateral international trade agreements and international stockpiles of materials to stabilize prices and production of basic raw materials. The trade agreements would fix ceilings and minimum acceptance quotas for materials among participating nations in much the same fashion the International Wheat Agreement does now. The stockpiles would be used to manipulate world prices for materials, buying at low prices and selling at high prices.

The NSRB said it passed over these suggestions "in the interest of prompt translation of some of the formal recommendations into action." It added, however, the suggestions are just as important as the formal recommendations and that they "must receive further study fully as thorough as that given the formal recommendations."

[From American Metal Market, December 23, 1952]

NSRB Urges Seaway, Modernized Mineral Leasing System in New Report

PROVIDES COUNSEL FOR MOTIVATING PROPOSALS IN PALEY REPORT

WASHINGTON, December 22.—The 100-page report of the National Security Resources Board to President Truman concerning plans to guard against exhaustion of our strategic-materials resources was made public today. The report represents a partial answer to a request for advice on what initial action should be taken to fulfill the recommendations of the President's Materials Policy Commission made earlier this year, the so-called Paley report.

Among the proposals listed in the NSRB report are:

1. A United States participation with Canada in the construction of the St. Lawrence seaway and power project.

2. A modernized mineral-leasing system as an alternate to staking claims on public lands.

3. Reduction or elimination of tariffs on raw materials in which this country is deficient.

4. More mineral technological assistance for underdeveloped areas of the world.

5. Greater participation of private enterprise in the development of nuclear energy.

The Board also recommended that the Interior Department draft the broad outlines of a coal research and development program with participation by Federal and State agencies, industry, and labor units, and private research organizations. It was suggested that Congress provide funds so that the Department of the Interior can start this program.

The report stated:

"In the long perspective even those material resources we now classify as exhaustible may prove to be renewable as we learn to convert and to utilize the elements available in the oceans and the atmosphere as well as in the land surface of the earth."

In urging a mineral-leasing system as an optional alternative to claim staking on public lands, the Board suggested that the Interior Department prepare draft legislation to carry this out.

It said the Defense Materials Procurement Agency vigorously opposed the leasing proposal, believing "abuses and shortcomings in the functioning of the laws can be corrected by better administration and enforcement."

But the Board said the intent of the proposed change is broader than a mere correction of shortcomings. It said the change is to provide a more flexible law and give greater latitude to private enterprise in choosing the means and methods it employs in discovering and developing mineral resources on public lands.

[From Journal of Commerce, December 23, 1952]

FOREIGN SOURCES STRESSED—NSRB BIDS U. S. SPUR MATERIALS PROGRAM

(By Joseph R. Slevin, Washington Bureau)

WASHINGTON, December 22.—The National Security Resources Board today told President Truman that the development of domestic and foreign raw-materials resources should be fostered by the Government in the interests of national security and the continued growth of the United States economy.

The group stressed that this country's raw-materials policies should be built around an effort to obtain an adequate flow of commodities at the lowest cost consistent with national security and the welfare of friendly nations. "Use of domestic resources should be buttressed by the use of low-cost foreign raw materials wherever possible," it declared.

TRUMAN SOUGHT REPORT

The NSRB submitted its recommendations to Mr. Truman in response to a request from the Chief Executive for an analysis of the program offered early last summer by the President's Materials Policy Commission, headed by William C. Paley, Columbia Broadcasting System chairman.

The Paley Commission emphasized the growing dependence of the United States on foreign sources of raw materials and urged the adoption of world, rather than domestic materials policies.

VIGOROUS POLICIES URGED

In a letter praising NSRB Chairman Jack O. Gorrie for today's report, the President said that "new and vigorous" policies are needed to check the long-term trend toward scarcity and higher costs of materials.

"This Nation will meet the great challenge of world leadership in the ahead," Mr. Truman said "only if it has the vision and courage to adopt constructive programs for the expansion of our economy while strengthening our security."

The NSRB commented on each of 78 formal Paley Commission recommendations for domestic and foreign-materials policy. It postponed consideration of several key problems raised by the Commission—including the controversial international commodities stabilization question—on the ground that the Commission made no specific recommendations.

The NSRB, however, strongly endorsed Commission proposals calling for repeal of the Buy American Act and congressional authorization of unilateral United States reduction of import duties on raw materials.

MUST HAVE STEADY MARKET AGENCY

"Such an approach," the NSRB said, "would contribute to a strengthening of our raw materials supply position and would, in addition, promote our objective of reducing trade barriers and develop more liberal trading policies not only by ourselves but by other countries as well. It would represent an enlightened, forward-looking policy and an example of economic statesmanship of high order."

NSRB said that a policy of unilateral tariff reduction would stimulate the long-range expansion of foreign supply as United States import needs grow.

"It does little good," NSRB said the Mutual Security Agency, reported "to lift a tariff temporarily in the face of extreme shortages if the tariff is to be restored when more normal market conditions are reestablished. Effectively to encourage the development of foreign sources of supply the United States needs to assure foreign sellers they will have continuous access to the United States market."

The NSRB report represents not only its own views but also those of 22 other interested Government agencies, including the State, Treasury, Defense, Interior, Commerce, and Labor Departments and the Mutual Security and Defense Minerals Procurement Agencies. The occurrence or disagreement of each agency with individual Paley Commission recommendations is set out in the NSRB report.

In a discussion of ways of expanding foreign sources of supply, the NSRB recommended further study of Commission proposals urging permanent authorization of long-term Government purchase contract and high-risk Government development loans.

It pointed out that the State Department believes the United States should not finance expansion of materials output except where the expansion is needed for security purposes and the financing is limited to quantitatively established production objectives.

FURTHER STUDY PROPOSED

Further State Department study was recommended of a Commission suggestion that investment in foreign minerals enterprises be encouraged by negotiation of an "executive resource treaty" between the United States and the resource country.

The NSRB endorsed two Commission recommendations for more favorable tax treatment of corporations with foreign operations. One would establish more generous provisions for crediting foreign corporate income taxes against domestic corporate income taxes, while the other would give the same treatment to foreign branch operations that now is given to operations through foreign subsidiaries.

Great stress is placed by the NSRB on United States technical assistance at home and abroad and on adherence to adequate conservation policies by Government and industry.

RESEARCH HELD IMPORTANT

The report also emphasizes the importance of technological development in solving materials problems and recommends an "aggressive" approach to the problem of using atomic, solar, tidal, and wind energy as power sources.

The NSRB's recommendations for domestic action include these:

1. Study by an interagency Commission of percentage depletion and other tax incentives for resource development, including the privilege of unlimited expensing of exploration costs, with a requirement that the committee report in 6 months.

2. Continued Federal development of multipurpose hydroelectric projects.

REVISION OF MINERALS LAWS

3. Bold revision of the laws governing use of the mineral resources of the public domain to retain the existing claim-patent system for independent prospectors, but provide a new concession-leasing system to conform with modern technology and prospecting methods.

4. Establishment of a permanent system of loans to small mining operations.

5. Provision of limited financial assistance to any qualified private company that will undertake the production of oil from shale.

6. Taking a census of the mineral industries in 1954 and every 5 years thereafter.

7. Encouragement of a long-run exploitation of timber resources by establishing national forest credit and insurance systems that ultimately would be transferred to private commercial banking and insurance systems.

[Washington News, January 8, 1953]

RESOURCES: SHORTAGES MAY BE AVERTED

NSRB SEES NO GOOD CHANCES OF AVOIDING RAW MATERIALS SHORTAGES, HIGHER PRODUCTION COSTS—PROPOSES STEPS TO MEET PALEY COMMISSION GOALS—GIVES FEDERAL AGENCY REACTION

Shortages of the materials needed to continue high production and gradual increases in costs of turning out items for the soldier and civilian may be averted, National Security Resources Board says.

Even though it appears supplies of some vital metals and minerals are rapidly vanishing, the possibilities of renewing them through scientific conversion methods are on the upswing.

In addition, there is growing promise of better utilization of substitutes, potentially of great value in stretching the known quantities of standard materials.

Initial steps: These are some of the optimistic comments offered by NSRB in its new recommendations to the White House regarding proposals made last summer by the President's Materials Policy Commission (the Iron Age, June 26, p. 55). In a 101-page pamphlet, NSRB proposes initial steps for meeting the Commission's objectives in the field of natural-resources management. The Board evaluated each of the Commission's 78 formal proposals, listing the concurrence or nonconcurrence of cognizant departments and agencies.

To encourage development of United States minerals resources, NSRB recommends a mineral-leasing system as an optional alternative to claim-staking on public lands. It calls for expanded geologic and topographic mapping, research on exploration techniques, and basic fact gathering by Interior Department.

To promote importation of raw materials in which we are deficient, NSRB asks for legislation authorizing reduction or elimination of tariffs on short-supply items, adjustments in tax laws to stimulate United States investment in exploitation of foreign resources, and repeal of the Buy American Act.

Needs time: Some of the materials-supply problems it studied, NSRB says, will require more attention before specific proposals will be in order. Studies are suggested on the question of incentive devices for mineral industries, criteria for direct governmental exploration for minerals sources, and methods of setting up strategic reserves of petroleum.

Two of the principal recommendations NSRB makes concern atomic energy and possible United States participation in the St. Lawrence seaway and power project. In the first instance, the agency urges a clearing of the way to greater private participation in development and use of atomic energy as a source of power.

Change act: Cooperation between Atomic Energy Commission and private concerns should be continued to "a maximum degree consistent with security," NSRB states. It calls for an amendment to the Atomic Energy Act outlining the conditions under which "private interests could operate commercially to benefit from their atomic power research, development, and production."

Chances for congressional approval of such an amendment may be good, for the act as passed in 1946 contains the statement that "any legislation will necessarily be subject to revision from time to time." AEC, Defense Department, Interior Department, and Federal Power Commission concur in the belief that private firms should be encouraged in developing ways for industry to utilize power from nuclear energy.

Should share: NSRB believes Congress should be asked again to "authorize and provide funds for" a United States share in the building of the seaway and power project, arguing that unless this country participates in the construction it will not share in managing the waterway.

The Paley Commission urged seaway participation.

[From Steel, January 12, 1953]

THE LONG LOOK AT MATERIALS

The National Security Resources Board proposes legislation to implement some of the Paley report recommendations. The move is toward a nonpartisan national materials policy.

The findings and recommendations of the National Security Resources Board and the President's Materials Policy Committee (the Paley Commission), gathered in a Democratic administration, may form the basis of Republican action during the next 4 years.

Those recommendations are for specific pieces of legislation to combat rising costs and eventual exhaustion of natural resources in this country and to provide sufficient energy for our expanding economy. The PMPC came up with 78 proposals (for more on the Paley report see June 30, p. 46); the NSRB reviewed them all but suggested legislative action in only some cases.

Two sided: Many of the proposals are so high on security lists, they have become bipartisan. Action on other recommendations of the NSRB is contingent

upon policymaking political decisions. Those include suggestions for the development "under public and private sponsorship" of hydroelectric power facilities, construction of the St. Lawrence seaway, a law allowing the Interior Department to manage offshore oil deposits, repeal of the Buy American Act and elimination of import duties on materials which the United States must import in great quantities.

What they said: Tipoff as to what may happen to key recommendations of the Paley report comes from the reactions of Government agencies and the NSRB (see the chart below). The NSRB quizzed the agencies for comments before sending its report to the President.

In general, the agencies agree on expanded factfinding and aid to industry in developing mineral resources. Exception is the tax policy which allows percentage depletion as a deduction in the minerals industry. On that point opinion varies widely. The NSRB proposes a committee be appointed to investigate the matter further and report within 6 months.

Wait awhile: While there is "general agreement" on the objective of easing tariff restrictions on imported raw materials or semifinished goods, little will be done with the NSRB recommendation until the Public Advisory Board to the Director of Mutual Security reports on the general international trade policy. Tariffs on materials is considered only a part of the bigger decision. The Advisory Board is expected to report soon.

Paley Commission recommendation	Goal	Government agency reactions	NSRB recommendation
No. 1	More fact gathering and analysis to encourage discovery and development of new domestic reserves of critical raw materials.	Agreeable	Department of Interior should be so instructed.
No. 6	Development of techniques and instruments of exploration for minerals	Agreeable, but need for interagency cooperation is cited.	No need for additional action. The National Science Foundation is active in this field.
No. 8	Alternate means of leasing federally owned mineral deposits	Agreeable	Legislation should be enacted.
No. 12	Retention of the percentage depletion rates now provided in Internal Revenue Code as an inducement to risk capital to enter the minerals industry.	Opinion varies widely, with the Treasury Department disagreeing strongly.	Question should be studied further.
No. 37	More geological surveys, preliminary exploration and advice on mining technology for underdeveloped areas of the world.	Agreeable	Legislation should be enacted.
No. 45	Permanent legislation eliminating import duty on any industrial material when the United States is largely dependent on imports. Repeal of the Buy American Act.	Agreeable, but cited as only one part of larger tariff problem.	Do.
No. 54	Development of hydroelectric power as fully and as quickly as is economically feasible.	Agreeable	Funds should be requested from Congress.
No. 70	A permanent stockpile of critical materials	do	Legislation unnecessary at this time.
No. 76	Development of the St. Lawrence seaway	do	Congress should be asked to proceed with the project at once.
No. 78	Continued life for the National Security Resources Board as a policymaker in the fields of materials, energy, and special security problems.	Agreeable, as long as duties are well defined and do not include fact finding.	Funds for such activity should be asked of Congress.

Development of hydroelectric power facilities and greater private participation in efforts to derive electric power from atomic sources both received approval of all commenting agencies, as did a recommendation for the development of the St. Lawrence seaway.

Unnecessary: Though the agencies approved a permanent stockpiling arrangement, the NSRB did not second the Paley report's recommendation for legislation to that effect. The NSRB says, "The language of the Stockpile Act, and the recent practice of the Congress in appropriating adequate funds for the procurement of materials for the strategic stockpile make specific action unnecessary at this time."

The NSRB suggestions included a recommendation for its own continued life in fact-finding, policymaking activities. Among dissenters from this proposal was the Agriculture Department which did not believe another fact-finding group was needed. If it gets extended life based on this proposal, NSRB activity will probably be slanted toward reviewing and recommending actions to the President rather than statistic gathering.

[McGraw-Hill Department of Economics, February 1953, pt. II]

Our Need for Materials Shapes a New Economic Policy

SUMMARY

The second step toward a new economic policy will be taken this fall when a citizens' conference, supported by the Eisenhower administration, meets to look into the raw-materials needs of the United States. The first step was taken by the Paley Commission last June. The Paley report said that Government credit, spending, and planning was needed to encourage the exploration for minerals, to develop resources, and to obtain materials from abroad.

President Eisenhower spoke of our material needs in his state of the Union message and said: "This calls for a strong Federal program in the field of natural resources development."

The Paley Commission made a detailed, five-volume study of the production and consumption of raw materials. An outline of their major findings and recommendations is contained in the attached report. One of their most crucial conclusions was that the price system is not adequate to bring about the needed exploration and development of materials. The Commission reaches these conclusions because the prices of raw materials have been notably unstable. People with savings are loath to make the large and risky investments necessary for the exploration and development of raw materials when there are wide and uncertain changes in prices. Hence, says the Commission, comes the need for Government planning and action.

Government planning versus the price system is the real issue brought out by the Paley Commission, and this is the issue that is likely to be haggled over by the citizens' conference and the Eisenhower administration. On this issue, the evidence is not all on the side of the businessman. The Paley Commission does have the facts right on raw material prices being unstable. After the Korean outbreak, for instance, prices of industrial raw materials soared up by 57 percent and then plunked back down to the pre-Korea level.

Government planning is not the only solution, however, to getting more of the raw materials needed by our vast and growing industry. Another alternative is to even out the price changes in materials by reducing large inventory changes by business. This is partly a matter of reducing private speculation, but Government itself has also caused commodity price swings through its buying.

Pressure to develop some new long-term policy for materials, either by Government planning or more workable prices, will mount as tension with Russia drags on. The United States now consumes about 10 percent more materials than it produces. The size of this materials shortage will grow as our defense needs, living standards, or population grows. These materials come to the United States over long and exposed lifelines. By contrast, Russia, which is developing a large heavy industry, has a compact colonial empire in the form of satellites right on her borders to supply raw materials.

If the United States cannot make the price system work smoothly to bring out materials, our national security may require us to choose between Government planning to mesh the economic life of raw materials' producing nations in with ours, or a slower rate of progress in industrial output and living standards. Government materials planning would result in a grand policy to guarantee high-level employment throughout the free world, with the United States making

fitting subsidies to keep the payments between nations reasonably in balance. Such a policy would dwarf the New Deal and Fair Deal in begetting big Government and huge spending.

These are the issues and the policies in the making; and if businessmen cannot present the case for a workable price system, it will have no advocates when the decisions are made.

OUR NEED FOR MATERIALS SHAPES A NEW ECONOMY POLICY

A forthcoming citizen's conference on natural resources, supported by the Eisenhower administration, adds timely interest to the report of the President's Materials Policy Commission issued last June. So, too, does President Eisenhower's state of the Union address, in which he says:

"Vitally important are the water and minerals, public lands and standing timber, forage and wildlife of this country. A fast-growing population will have vast future needs in these resources. We must more than match the substantial achievements in the half-century since President Theodore Roosevelt awakened the Nation to the problem of conservation. This calls for a strong Federal program in the field of natural resource development."

The most recent and complete study of our resources and needs for raw materials was made by the President's Materials Policy Commission, also known as the Paley Commission. The Paley Commission says that we need a new economic policy to be sure that we will have enough raw materials for our future industrial growth. The policy suggested by the Paley Commission includes the use of Government credit, spending, and planning to encourage exploration for minerals, to develop resources, and to obtain materials abroad. The purpose of this study is to indicate the nature of the Paley Commission report and raise some questions about its conclusions.

The issues raised by the Paley Commission are of surpassing moment to businessmen. President Eisenhower has expressed a strong interest in our resource development, and the Paley report is likely to be the point of departure for new discussions on our material needs and resources. Businessmen, as producers and users of raw materials, will be vitally affected by any new materials policy that may take shape.

A citizens' resources conference to be held

Recognizing the importance of this subject, the Ford Foundation has set up a new company called Resources for the Future, Inc., which will undertake "long-range programs of research and education to assure the resources essential to the progress, vigor, and security of the Nation." To this end, Resources for the Future, Inc., had arranged a citizens' conference on natural resources policy for March 25–27 at the Mayflower Hotel in Washington, D. C. Invitations to about 1,000 industrial, farm, and labor leaders and top Government and academic figures were to be sent by the White House. Last fall, President Truman and the then President-elect Eisenhower both pledged support for the conference.

The Eisenhower administration has now asked for a postponement of the conference until next fall. The reason for the change is a charge by the United States Chamber of Commerce that the conference was to be run solely by New Dealers and professional conservationists, leaving businessmen out in the cold.

As plans now stand, the Citizens' Conference on Natural Resources Policy will be held next fall, presumably to be run with the aid of businessmen. This will be the first conference of its kind since the 1908 conservation meeting called by President Theodore Roosevelt.

President Eisenhower said: "It is high time that the conservation conference of 1908 should be reborn in a midcentury setting."

Will anything come of it?

Is this just another conservation meeting to be held and forgotten? Or will this conference, along with the Paley Commission report, launch us further on the way to a new economic policy? If a new economic policy is indeed taking shape, businessmen should certainly know the issues and add their voice to the decision.

The best way to see what is at stake is to take a look at the high points from the report of the President's Materials Policy Commission.

The problem of rising demand and dwindling resources

A serious raw material problem is shaping up as the Commission sees it, because American industry is so tremendous in size, its appetite for materials is voracious, and its needs are still growing. The United States has only about 9½

percent of the world population and 8 percent of the land, but it uses about 50 percent of the world's iron, copper, lead, zinc, and manganese. It uses about two-thirds of the oil and rubber.

Such a huge gobbling up of materials by American industry is problem enough, but the demands are growing even bigger. In 1900 the United States consumed $8 billion of materials. By 1950 this had risen to $20 billion, or increased 153 percent. The Commission estimates that by 1975, we will need 50 to 60 percent more materials than we are using now.

The consumption of materials in the United States is growing faster than our ability to produce them. In 1900, the United States produced 15 percent more raw materials than it consumed. In other words, we exported materials. By 1950, we were using up 9 percent more materials than we produced. There was a materials deficit of 9 percent which had to be supplied by importing materials from foreign countries. The Commission estimates that by 1975 we will be 20 percent short of producing our own material needs. That is, the materials deficit will grow from 9 percent to 20 percent, and we will have to import still more from abroad.

Contrary to some popular news summaries, the Paley Commission has not become an alarmist about these material scarcities. They do not say that we are a "have" Nation but soon will be a "have not" Nation. The United States is now the biggest producer of materials in the world. In 1975 we will still be the biggest materials-producing Nation. The point is, however, that it will cost more per unit to produce the materials if we try to meet all of our growing needs. In oil production, for instance, the average depth of oil wells has increased by 38 percent in the past 15 years and there are more "dry holes" in relation to strikes. Clearly, it takes more manpower to turn out the same amount of oil if you make fewer strikes; and it takes more steel per well to drill deeper. The same situation exists in iron ore. As we are forced to use lower-grade ore, such as taconite which is a very hard rock, it takes more labor and more machinery to mine the ore and separate the iron. Similar conditions exist in copper, lead, and other materials. Our growing material requirements, therefore, can only be met in the United States by higher production costs. We will have to devote more manpower and machinery to getting out materials, which means we will have less manpower and machinery than otherwise for manufacturing finished goods. Clearly our standard of living will suffer.

There is one other possibility, however. We can import more of these materials from other countries where they can be produced more cheaply than here. This would make it possible for us to use more of our manpower and machines in the manufacturing of goods and less in materials production. This is the problem as the President's Materials Policy Commission sees it. We have growing needs for materials. We can make the choice for the future of trying to produce these materials ourselves at higher cost, or we can import more of them.

Assumptions in the report

The urgency of getting more materials from abroad, or developing lower cost methods of producing them here, clearly depends upon how fast our material requirements are growing. This requires a look into the future. Since none of us mortals are blessed with magical powers of prophecy, any projection of our raw material needs rests upon some assumptions about what the future will be like.

The report of the Paley Commission rests on four major assumptions:

1. The Commission assumes that the rate of growth in gross national product will be about 3 percent per year. At this rate, gross national product would double by about 1975.

2. The Commission assumes that there will be no foreseeable new uses for materials, no new substitutions of materials, or no technological developments in the improvement of materials production. This is obviously a very unreal assumption because new uses, improvements, and substitutions are occurring all the time. The Commission recognizes that this assumption is unrealistic, but it makes this argument. No one knows what new discoveries in the use or improvement of materials will take place. In some measure these discoveries are a matter of chance. Since discovery is irregular and matter of chance, we would be unwise to count on it. To do so is like counting eggs that have not hatched. When dealing with our future and our children's future, the Commission argues, it is the part of prudence to be conservative. The conservative

assumption is no discovery or technical progress in the use, improvement, or substitution of materials.

3. The Commission assumes that the relative prices among the various metals will remain the same as in early 1950. This follows from the idea that there will be no new uses or technical improvements in materials. The price of a pound of aluminum is now roughly about 80 percent of the price of a pound of copper. The analysis of the Paley Commission assumes that this will not change. By 1975 a pound of aluminum will still sell for about 80 percent of the price of a pound of copper. Now if there were to be no substitutions of metals, and if there were no change in production costs, this would happen. But we know production costs change with mining conditions and the grade of ore. We know, too, that aluminum has been substituted very heavily for copper in recent years. The effect of substituting aluminum for copper is to lower the price of copper in relation to aluminum. But this possibility has been ruled out in the Commission report by its assumptions.

4. The Commission, even though it pays lip service to the price system, actually assumes that market prices will not do an adequate job of bringing out a supply of raw materials to meet our needs.

The Commission says "we believe in private enterprise as the most efficacious way of performing industrial tasks in the United States. With this belief, a belief in the spur of the profit motive and what is called 'the price system' obviously goes hand in hand. This method, motive, and system have served uniquely well in America." After delivering itself of this rousing praise for the price system, the Commission throws in a hasty "but." It is, in fact, a very big "but." The Commission really believes that the price system often does not work well in bringing out the necessary production of raw materials. "Increasing prices may fail to bring out as much production as would be profitable at that price. Mine operators may not expect the price to stay high; investment conditions, or attitudes of this or foreign governments, may impede production or slow export expansion. Inventors may turn too late to devising better methods, or long years may elapse between the development of better techniques and their actual adoption. Research that would benefit all may not repay any one enterprise. And depressions, in the past, have demonstrated that the price system cannot handle all problems. There is accordingly room for an economic materials policy. The guide to public action must therefore be a study of where the private market works so imperfectly that something must be done about it."

The private market works very imperfectly, indeed, judged by the number of recommendations the Commission comes up with where Government action is needed. We will examine these in a moment. In the meantime, we may conclude that, in spite of its lipservice to the price system, the Commission really assumes that in the future the price system cannot do a satisfactory job of bringing out the necessary raw materials for the United States economy.

If these four assumptions can be accepted, most of the rest of the Paley report appears to be fairly logical. The most crucial question about this report, then, is whether these assumptions are really true or are necessary. But before asking this question, let us hear the Commission out and see where these assumptions lead in the way of recommendations and conclusions.

Brief summary of findings and recommendations of the Paley Commission

The summary which follows does not presume to be anything like a complete outline of the Paley Commission's report. Indeed, it is hard to do this report justice in summary fashion. Whatever may be said of the report in other respects, it is a monumental accomplishment to have gathered together such a wealth of information on our material resources. Instead, the summary which follows tries to cover some of the major findings of the Commission and enough of its recommendations to show what the Commission is seeking to do.

First, let us take a general look at the Commission's estimate of the percent increase in consumption for different kinds of materials by 1975.

TABLE 1.—*How United States consumption of materials might rise by 1975*

Material:	*Percent increase, 1975 over 1950*
All raw materials	53
Agricultural materials	39
Forest products	17
Minerals, total	90
Iron	54
Nickel	100
Tungsten	150
Copper	43
Aluminum	291
Magnesium	1,845
Tin	18
Fuels	97
Coal	54
Petroleum	109
Natural gas	142
Construction materials	35

From this list we can see that minerals and fuels present our greatest problem. Even some of these, however, are plentiful in the United States. The Commission reports that the supply of magnesium, molybdenum, coal, potash, and phosphate, for instance, are adequate for well over 25 years. Some of the materials for which the known economic reserves are not adequate include: copper, lead, zinc, petroleum, natural gas, iron ore, aluminum, magnesium, chromium, and nickel.

Mineral resources

Because the reserves of some minerals and fuels are not regarded as adequate by the Commission, there is an urgent need for finding and developing new domestic supplies. But here we run into exploration problems. The report says: "Geologists agree that the United States still possesses vast hidden mineral resources, but they cannot tell how great these undiscovered resources may be, indicate where individual deposits lie, or guess how many could be worked at a profit. They also agree that extensive new discoveries of traditional materials will call for new methods. Prospectors already have combed nearly every square mile of the continental United States and large areas of Alaska. Not much more can be expected from the search for outcroppings of minerals that have long been commercially important. From now on, the search for these minerals must be directed toward deposits hidden in the earth."

Exploration for minerals hidden deep in the earth is obviously going to be more costly than prospecting in the past. It will take more money, more research talent, and development of new exploration instruments. Such exploration is clearly a large-scale, team operation. Who will do it? The Commission takes the viewpoint that private enterprise has done a good job of developing mineral deposits once they are found, but that it has not been vigorous enough in exploration. This is true because exploration costs may be large, and the risk of not making a strike is great. The crux of the problem, in the eyes of the Commission, is to hasten the exploration of new deposits. Here is what it recommends to step up minerals discovery:

1. The Commission believes more facts should be gathered on mineral resources. This can be done by having a census of minerals every 5 years, hastening geologic mapping of the United States, setting up both public and private analysis staffs to appraise the mineral and energy position of the United States, establishing a national library of core samples made from drillings throughout the United States, and forming a research program to improve instruments of exploration.

2. The laws governing mining claims and leasing should be revised to require more rapid development and greater exploration.

3. The Government should grant financial aids to small mining operations.

4. Percentage depletion for tax purposes is a strong inducement to exploration, but the Commission recommends no further extension of its use.

5. The Commission recommends that the Government should undertake its own exploration on public lands when the risk is great.

Timber resources

While the timber demands are not growing as fast as those for minerals, the 1970's will still be a period of tight supply for lumber. The use of sawtimber in 1950 outstripped the rate of growth by almost 50 percent. Timber has been treated more as a mine product than a crop. This is clear from the pricing of timber. The price of lumber products has, until recently, been determined mainly by costs of logging, milling, and transportation—without allowance for the cost of regrowing a new crop. The treatment of timber as a crop in the future will result in higher costs. It also calls for better forestry management and technology. The Commission, therefore, recommends a larger forest service for fire fighting, more forest research, an expanded pest-control program, education in forest management, a forest credit system to provide long-term credit at low cost to timber growers, Federal financial aid to the States for forest-planting programs, and Government construction of timber tap roads.

Agricultural materials

A 40-percent increase in agricultural materials will be needed by 1975, according to the Commission. It is important that this expansion take place smoothly; for if it does not, the pressure to produce foods will reduce the materials raised on farms for industry. Farm experts estimate that an increase in farm output of about 33 percent by 1975 should be possible by spreading modern agriculture technology. Use of fertilizer, better hybrids and strains of food plants and livestock, plus improved feeding, could raise production about one-third. The balance of the 40-percent increase could be obtained by putting some new land into occasional use. About 100 million acres of grassland and woodland could be rotated between pasture and crops. The Commissioners do not make specific recommendations on agriculture because they feel this is a special problem outside their field of inquiry. Yet they do suggest the need for a new type of farm mortgage that can be enlarged to take care of a revised farm plan, for longer production loans, a price-support program with more incentive to shift production to needed materials, and continuation of flood control and soil conservation.

Water resources

The water requirements of modern industry are immense. Water uses include steam generation, washing, cooling, conveying, and as an actual manufacturing ingredient. Industry uses 50 times as much water by weight as all other materials combined. This requires a flow of 80 billion gallons a day now, and about 200 billion gallons a day will be needed in the next quarter century. Water has been taken for granted as an industrial material until recently, because there has been plenty of it. But the pinch for water will grow sharper from now on. By 1975, access to good water may become the most important factor in locating industry. About three-fourths of industrial water is now used for cooling, and the next largest volume is used for washing, grading, and waste disposal. Much of this water can be of low quality. One step to meet future water needs would be to grade the water and allocate poorer water to low-grade uses where quality is not important. Other steps recommended by the Commission are development of new watersheds and water resources by the Federal Government, pollution control, and recycling or recirculating water in industry.

Energy resources

The use of fuels instead of muscles has been, above all, what has given us an industrial Nation and a high standard of living. We will need about twice the supply of fuels and electricity by 1975. Coal is still the largest source of energy—supplying about half our needs. Much of the use of coal is for the steam generation of electricity. Coal reserves are abundant, enough to supply our needs for centuries. But coal cannot easily be mined and delivered at a competitive price compared to other fuels. For this reason, the Commission recommends that the Government share in a research program to reduce the costs of coal.

Oil is the next largest source of energy, but here the United States has limited domestic reserves. The result is that the costs of producing oil (particularly drilling deeper wells) will rise from now on. The Commission recommends the need to reduce waste in production of oil, more conservative spacing of wells, Federal Government encouragement to offshore oil exploration, and Government help in financing the development of oil from shale.

The supply of natural gas is somewhat better than oil, but the demands for natural gas are growing very fast. Prices and profits will probably operate to locate new natural gas resources and put them to their most economic use. The Government may need to step in, for conservation reasons, to reduce waste by flaring or burning at the well. Further pipeline regulation may be needed, according to the Commission.

Electricity requirements in the future will be very large, up 260 percent by 1975. Main reliance should be placed on coal generation, but the Commission also recommends that the Government should develop the maximum hydroelectric capacity and begin atomic generation.

The task of technology

In view of the materials shortages in the future, the scientists and engineers have the challenging task of improving the use of materials. Consumption of metals, for instance, has up to now had no relation to their abundance in nature. Silicon, which makes up 28 percent of the earth's crust, has limited industrial uses. Copper, the second ranking metal in usage, represents only 2 parts in 100,000 of the earth's crust. Science and engineering can do much, therefore, by developing uses for materials that are abundant in nature. They can also relieve the materials problem by developing substitutes, improving methods of mineral discovery, developing the refining of low-grade ores, by eliminating waste and reusing scrap, and by making more use of materials that can be grown from energy of the sun. To hasten these accomplishments, the Commission recommends that Government research be better coordinated and that larger appropriations be given to the National Science Foundation.

Materials from abroad

In spite of the recommended efforts to increase domestic supplies of materials, the United States will have a strong need to import materials from foreign lands. Even if we do all we can to increase production of copper in the United States, for instance, the Commission says we will need to import 1 million short tons of copper in 1975—or 5 times as much as we imported in 1950. Similarly, the United States will have to import about 3 times as much iron ore, 3 times as much zinc, and 4 times as much lead. This calls for very large increases in materials production in foreign countries. How is it to be done?

Here the shortcomings of market price are most sharply criticized by the Commission. It notes that market prices for raw materials in world trade show wide swings. These drastic price changes are a hindrance to investment as well as a hardship on the workers in raw materials producing nations. The Commission, therefore, makes a wide variety of recommendations to encourage the investment in resources abroad.

The instability of market price should be reduced, according to the Commission, by—

1. International price agreements.
2. Long-term purchase contracts.
3. International buffer stocks.

(NOTE.—Both international price agreements and buffer stocks amount to a subsidy, either to the seller or the buyer, to keep prices steady.)

Private investment by United States firms in foreign resources should be developed by—

1. Getting local participation in ownership and management to avoid unfavorable action by foreign governments.
2. Developing formulas for the fair sharing of profits between the private firms and the foreign government—such as the 50–50 sharing formula in petroleum.

Government assistance to private investment by United States firms shall be undertaken by—

1. Investment treaties which define the rights of investors and assure them against expropriation, undue control or discrimination by a foreign government.
2. Special resources agreement which gives the United States Government a concession to develop a resource which it may in turn lease to a private business.
3. Bilateral tax treaties to eliminate double taxation of income, or the United States Government might give full credit for foreign taxes.

Trade barriers should be removed by the Government, says the Commission, by—

1. Passing legislation letting the United States Government, acting alone (without any reciprocating tariff reductions), eliminate import duties on individual raw materials in crude or refined form.

2. Repealing the buy-American laws, which require the United States Government to purchase from domestic producers.

3. Changing export controls so that raw-materials producing nations can get necessary mining and production equipment.

Direct Government action to obtain materials is recommended by the Commission where necessary. This would be done by—

1. Giving direct technical or financial aid to foreign countries for developing resources.

2. Passing permanent legislation allowing the United States Government to enter into long-term (10-year) contracts for foreign-produced materials.

3. Undertaking direct United States Government ownership and operation of foreign resource projects, or passing the laws letting the Government make management contracts for operating mining enterprises which it owns.

Sizing up the Paley Commission report

We have now looked over the main findings and recommendations of the Paley Commission report. From a business point of view, the report clearly contains some very strong medicine. For instance, we try to keep Government out of business at home; but the recommendation for the United States Government to operate mining properties abroad puts our Government into business in foreign lands. Again, international price agreements and buffer stocks of materials are a means of price support. Hence a price-support program, similar to that now used to subsidize American agriculture, would be extended to all the non-Russion world that produces raw materials. Even the more modest recommendations to hasten domestic discovery of minerals, to manage our timber as a crop, to develop water resources, to speed scientific progress—all of these call for more Government spending and planning. The Paley Commission is, without a doubt, recommending very drastic action. Indeed, the report points to bigger Government and more planning.

Shortcomings of fact

The most obvious failing of the Paley report—but one that is really not basic—is a somewhat careless use of statistics. Some of the graphs, for instance, do not agree with the tables—an offhand use of statistics that hardly inspires confidence in the quality of research. Then too, some businessmen have charged the Paley Commission's figures on production and consumption of material do not check with industries' facts. Another criticism is that the whole argument of our material needs is based on the statistical assumption that the United States economy will grow at the rate of 3 percent per year. This is a very simple, straight-line projection which is neither certain nor particularly realistic.

As a result of these factual shortcomings of the report, there has been some attempt to laugh the Paley report out of court as a poor piece of research. The report undoubtedly is spotty in the quality of its factfinding. But the proper answer to those who would deride the report is, "If you don't like it, let's see you do a better research job." Critics of the Paley report would probably find it difficult to assemble a staff of people or a set of facts on the subject of our natural resources that would command more respect and unanimity than does the Paley Commission report.

Shortcomings of judgment

A better research job could be done by getting rid of two assumptions made by the Paley Commission: that there will be no substitution of materials for each other; and that the relative prices of materials will remain the same. These assumptions are nonsense on their very face. Substitution of materials goes on at a tremendous pace, with powerful effects on prices. The Paley Commission ducked this problem because of the difficult judgments they would otherwise have had to make.

A different kind of materials report could be made by assembling a group of scientists and having them examine the kinds and amounts of substitution that would take place among materials in the future. This kind of research could have yielded very different conclusions. The future needs for copper, with enough substiution, for instance, might be within the production range of present resources.

This kind of research would have been "better" in the sense of being less artificial than the present Paley Commission report. But such a report would have been still more controversial. These judgments on the range of substitution could be called "speculative" and there is always one expert who can be found who will differ violently from the rest.

Do the facts make any difference?

Even if the Paley Commission is wrong on some of its facts, it probably does not make much difference. As the report itself points out: "There is room for wide differences of judgment in this difficult area of demand projections, but one point of overriding significance stands out. Whether it is estimated that the demand for a particular material will rise 50 percent, 100 percent, or 200 percent, the central point is still that demand can be expected to rise substantially. This is not always a popular view to espouse. Businessmen the world over are certainly more fearful of producing too much of their product than of having a certain amount of unsatisfied demand. Yet economic history certainly records more underestimates of the future than overestimates. Depressions and recessions, historically viewed, become smaller episodes in a longer and more heroic tale. There is no reason to assume that a world which has been growing economically by leaps and bounds for many generations will suddenly become static in this generation."

The Paley Commission, in short, takes a hopeful and dynamic view of our economic future; and it is hardly fitting that businesmen should suddenly adopt the doctrine of economic stagnation.

There is reason to believe that the charges of incorrect facts and poor research which business groups have aimed at the Paley report do not join issue with the crucial problem. The factual shortcomings of the report are distinctly secondary to something more serious—the ideas, the policy, the philosophy of the Paley Commission.

The real issue: Prices versus planning

The most serious and vulnerable part of the Paley Commission report is its assumption that the price system will not do the job of supplying our material needs. The merits of prices versus Government planning as the means of obtaining raw materials for our future industrial growth need to be threshed out. This is the real issue. And in this issue the evidence is not all on the side of the businessman. The Paley Commission has at least got this fact straight—that is, the prices of raw materials have in the past swung in wide gyrations.

Let us look, for example, at how the wholesale prices of industrial raw materials behaved after the outbreak in Korea. From June 1950 to January 1951 the prices of industrial raw materials soared upward 57 percent. By January 1953 they had dropped back down to about their pre-Korea level.

Wide swings in raw materials prices clearly cause trouble. They make investment uncertain. Savers do not want to risk their money when they do not know from one moment to the next what prices or profits their investment will bring. Even worse, the raw-materials-producing nations are alternately riding high or being squeezed through the wringer. The real hardship of wide materials price swings falls on foreign workers. They have a low standard of life in the first place and are further harried by frequent unemployment caused by widely changing prices. This is certainly one of the reasons behind the unstable politics of South America, Asia, and Africa.

To the Paley Commission the answer is planning. By planning and subsidy we get rid of these large price changes and build a more stable economy for our allies as well as a surer supply of materials for ourselves.

This is the case for the Paley Commission, and it sounds quite impressive until you examine the effectiveness of planning as compared to market price. Surely, we must admit that the price system has some defects. But can planning do any better job in arranging for the production and use of materials? There is reason to doubt it.

The potato fiasco, for instance, certainly does not create great confidence in planning. Planners in the United States Government first had farmers burn surplus potatoes in the fields, and the next year we had a critical shortage of potatoes.

Of all the colossal blunders in the buying of raw materials in recent years, few have equaled the ineptitude of the British Government planners in stockpiling lead. The British Government scrambled to buy lead after the outbreak of Korea, helping to drive the price up and to create the dollar gap which later

threatened its solvency. Two years later they found they did not need the lead, dumped it, broke the market price, with the result that lead mines shut down around the world.

The United States performance in the buying of tin was equally lefthanded and has been said to be the cause of the revolution in Bolivia.

The widespread government planning in Western Europe since the end of World War II has hardly been a conspicuous success. England and France are particularly bedeviled with shortages and an excess of imports. The two countries which have made the most rapid recovery are Belgium and Germany, both of which ditched planning in favor of a more free economy governed by market price.

We may conclude that unstable prices have been a handicap to the development of material resources, but that government planning can scarcely do a better job. Is there no other solution?

An alternative

Another way to make raw material prices more stable is to level out the wide changes in Government buying and business inventories.

During the period following Korea when raw materials zoomed upward by 57 percent and then plunked back down again, businessmen were first piling up inventory at a rate of $14 billion a year and later dumping their inventories at a rate of $1 billion a year. Part of this wild inventory behavior was due to the difficulty of judging inventory needs in the defense buildup. But part of the trouble was also speculation.

Many of the wide price swings in raw materials could be eliminated if Government buying did not upset the market and if businessmen refrained from speculation in commodities and from large changes in their inventory. In short, a little economic statesmanship on the part of business management would make most of the recommendations of the Paley Commission unnecessary. If economic statesmanship is too much to expect of businessmen—and this would be a sorry admission indeed—then it is possible to put some teeth in law to make virtue easier to bear.

Restricting bank loans for commodity speculation, taxing away speculative gains, and laying tax penalties on business for large and sudden change in inventory would do much to make inventory speculation unattractive. The result would be more stable prices for raw materials. These suggestions may seem harsh to the freewheeling businessman. But they represent a very modest kind of economic policy compared to what the Paley Commission recommends.

Future economic policy according to the Paley Commission

The Paley Commission does not give a vision of what its recommendations would lead to in the future. But it is not hard to conjure up the vision. If the Government were to use its credit, its spending, and its treaty powers to plan the exploration and development of resources—even going into the mining business when necessary—we would very likely see these three developments:

1. The balance of international payments would become the means of guaranteeing high-level employment around the world. The Government always needs a gimmick or method to simplify the economic world with its millions of individuals, each acting separately, into some manageable and factual form. Since many raw materials come from abroad, the balance of payments is the most ready tool for keeping track of how the nations are faring. The balance of payments is the difference between the income and outgo of money arising from international trade. If a country has to import too much, it usually has more payments abroad than it can meet. The aim of the Paley Commission is to make the raw-materials-producing nations in the free world complementary to our economy. They would supply us with a steady flow of materials which we need, and we would repay by sending them equipment and consumer goods. Clearly this is a square deal for our foreign friends only if their imports, exports, and payments are fairly well in balance. If payments get out of balance, the United States would need to raise or subsidize the price of their materials, or to make loans or gifts so they could keep supplied with consumer goods. In short, the United States would watch the balance of payments of raw-materials-producing nations. Whenever our foreign friends owed more than they could pay for with raw materials, we would subsidize raw materials prices to strike a balance. Such a worldwide scheme would amount to insuring high employment in foreign lands. The New Deal and Fair Deal schemes of maintaining employment at home would pale by comparison. Our present-day budgets would look like petty cash funds compared to the money it would take to shore up business conditions in the entire free world.

2. The home economy of the United States would become more closely controlled if the Government were to take a hand in determining the needs for materials. We have seen what a tight grip on industrial activity the Government gained through the allocation of materials in World War II and the present defense program. Perhaps materials control would not be as extreme if the Government were merely trying to encourage exploration to balance the overall supply with demand. Yet, it is very hard to achieve this balance without telling suppliers they must produce more or less materials, and telling buyers they should consume more or less. Having the Government tell producers and buyers what they should do with materials is not a harmless pastime.

Our two experiences with the controlled materials plan show how firm a control Government can grasp on the economy by material allocations. There are three ways to control a nation's industry. One is to take over the factories—as Socialist and Communist countries do. Another is to control materials. And the third is to control the use of labor. While the United States has consistently forsworn nationalization of industry, we have not been so circumspect about avoiding control over materials and labor.

3. The rate of technical progress and the rise in the standard of living could be expected to slow down if the Government took a part in the production and consumption of materials. The Government, again to simplify matters so they are within its grasp, often operates by freezing existing conditions and then making someone prove that a change is needed. This is true of the Federal Government budget, price control, wage control, material allocation, and many other fields. A typical budget procedure is to take the historical appropriation for a Government department and then make the department prove why it needs more money. A typical price-control procedure is to take a price ceiling, frozen as of some past date, and make a businessman prove why he needs a higher price. A typical method of dealing with materials, under the kind of scheme suggested by the Paley Commission, would be to assume the present rate of production and consumption of a material as the desirable amounts. The Government would try by subsidy, stockpiling, or contract to perpetuate existing production and supply. This could be done, as in the case of copper, only by higher costs as lower grade mines had to be operated to keep up the supply. The effect of the Government subsidy would be to discourage the substitution of other metals for copper, unless some citizen made a persuasive case for the substitution. The Government would then be holding hearings on the desirability of technological change. The speed and wisdom of Government action is not so admirable that our state of knowledge can be entrusted to it.

The economic policy that is likely to shape up, if the recommendations of the Paley Commission prevail, would include: Maintaining high levels of employment throughout the free world through evening out the balance of payments, large Government spending, more control over United States industry at home through materials planning, and a slowing down in the rate of technical growth.

The planner's ace in the hole

Well, one may say, this sounds very dreary indeed, but it just will not happen. We have a new administration in Washington that is dedicated to getting rid of big Government and controls, not adding to them.

Very true, but as long as there is an uncorrected trouble spot in our economy, we could still get the Paley Commission's type of economic policy, even from the hands of the Republicans.

The ace in the hole for the planners is that military necessity may force us into a grand policy to control materials. The United States faces a long ordeal in opposing Communist aggression. Russia has built a large heavy industry, which will become still bigger. In addition, the satellites annexed by Russia amount to a vast colonial empire supplying raw materials for the Soviet industrial machine. The satellites border on Russia. Their materials can move by land transportation.

The United States, by comparison, has at present a larger industrial machine but a more precarious supply of materials. Our lifelines for materials are long and exposed. Many materials come to us from overseas, instead of across adjacent boundaries. Furthermore, our need for materials is greater because we—and the whole Western World—are committed to a higher standard of living for our citizens, as well as armed defenses.

The need for materials by the United States is, therefore, critical compared to the Russian situation. If the tension between Russia and the United States should last for years, an unsolved materials problem would lead to Government

intervention. No political party, Republican or Democrat, could then oppose a broad new economic policy such as the Paley Commission has outlined, for our self-preservation would be at stake.

Conclusion

A planned materials policy run by the Government has become a definite possibility as a result of the continued Russian threat to our national security. An alternative policy would be to take steps to prevent extreme fluctuations in the prices of raw materials. Beyond this, private investment to develop resources and obtain materials from abroad will be necessary on a greater scale than in the past. Working out devices for evening out price changes and encouraging investment will take time and thought. It is not too soon to begin that thinking now.

In the beginning we said the purpose of this study was to see if we needed a new materials policy. The answer is, "Yes." We will need more materials for our own economic growth and our national security. But we do not necessarily need the economic policy suggested by the Paley Commission. The real question is whether a new materials policy will be forthcoming through Government planning or business leadership.

[Monthly Review, the Bank of Nova Scotia, Toronto, February–March 1953]

CANADA AND THE PALEY REPORT

The Review for last month, entitled "The Trend of Prices," discussed the near-term outlook in the basic commodity markets and arrived at the tentative conclusion that there were at least as many signs of weakness as of strength. The current Review also deals with the outlook for some important basic commodities, but from a long-range point of view, looking a quarter century ahead through the eyes of the United States report entitled "Resources for Freedom."[1] The Paley report, as it is popularly called, presents a long-term prospect decidedly favorable to many of the commodities which Canada produces in abundance.

The Paley report is an American document written from an American point of view. Its emphasis is on how to assure an adequate supply of key materials, especially minerals, for the United States at the lowest possible cost consistent with security considerations. Thus, its most valuable contribution is its assessment of future United States consumption and of future United States imports of these materials, though it also contains interesting estimates of the requirements of the rest of the free world. In addition, it makes many useful and stimulating suggesttions for policy concerning the conservation and use of materials. In coverage, the report does a thorough job on minerals and energy sources and contains an interesting section on forest products. In addition to foods, it leaves out of consideration textile and cordage fibers, vegetable oils and hides.

The broad conclusion of the report is that United States consumption of materials, with the exception of foods, may be almost two-thirds greater in the decade of 1970 to 1980 than in 1950. It indicates that in that decade, represented for the sake of convenience by the year 1975, the United States will depend on imported supplies for about 20 percent of this much larger consumption as compared with 9 percent now. This general increase in United States consumption of materials will be made up of widely varying increases among the different commodities over the quarter century. United States consumption of lumber, for example, is placed at only 10 percent more in 1975 than in 1950, while the use of aluminum 25 years hence is put at nearly four times the current level, and for such metals as titanium, cadmium, cobalt, and magnesium even greater increases are regarded as likely.

Similarly, there are great variations in the expected degree of United States dependence on imported supplies. The United States will become much more dependent on imports of copper, lead, zinc, and iron ore. By 1975 even imports of oil will likely be substantial. No major change is anticipated in the almost complete reliance of the United States on imported supplies of nickel, asbestos,

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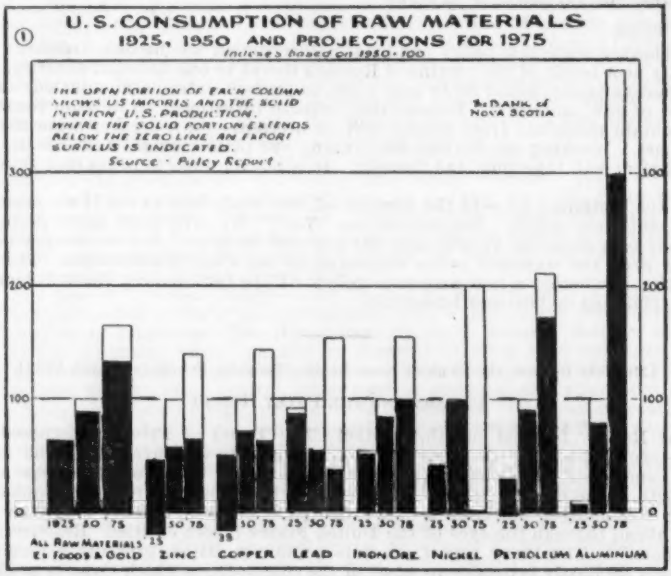
[1] Report of the President's Materials Policy Commission, June 1952, 5 vols., U. S. Government Printing Office, Washington, D. C.

or tin, though imports of natural rubber may decline markedly with rising synthetic production.


U.S. CONSUMPTION OF RAW MATERIALS
1925, 1950 AND PROJECTIONS FOR 1975
Indexes based on 1950 = 100
THE OPEN PORTION OF EACH COLUMN SHOWS U.S. IMPORTS AND THE SOLID PORTION U.S. PRODUCTION. WHERE THE SOLID PORTION EXTENDS BELOW THE ZERO LINE AN EXPORT SURPLUS IS INDICATED.
Source - Paley Report
The Bank of Nova Scotia
300
200
100
0
1925 50 75
All Raw Materials Ex Foods & Gold
Zinc
Copper
Lead
Iron Ore
Nickel
Petroleum
Aluminum

Past and projected levels of United States consumption and imports of industrial materials as a group and of some specific minerals of particular interest to Canada are shown in chart 1. In making the projections, it is assumed that the gross national product of the United States in real terms will increase at the average rate of 3 percent per annum over the next quarter century, or will approximately double. It is not expected, however, that the use of materials will rise as much, since the increase in the complexity and refinement of finished products and in the demands for services, already apparent in recent decades, will almost certainly continue. While these assumptions seem reasonable enough in projecting the total United States consumption of materials, the further assumptions made in the projections for individual commodities are much more open to question. One of these is that price relationships among the various commodities will remain the same up to 1975 as they were in early 1950. Though some such assumption must be made in order to estimate future demands, it is perfectly clear, as the report says, that relative price changes will, in fact, occur and alter the pattern of demand and production. Further, only those technological changes which are now "clearly foreseeable" are taken into account. Here again, though some such assumption is necessary, it is open to serious question. For example, new methods of locating minerals may prove to be more effective than the report has assumed, with the result that some of the minerals concerned may be more plentiful. Finally, it is assumed that the "cold war" will continue indefinitely or, as the report puts it, there will be "peace and prosperity in the constant shadow of war."

Though these qualifications must be kept in mind, the projections in the Paley report are, nevertheless, of great significance. Their interest to Canadians is enhanced by the shift toward the United States that has already taken place in Canadian exports, and by the active role of United States concerns and investors in Canadian resource development. Indeed, the increase in the dependence of the United States on imported materials in the last 25 years has already had a profound effect on the Canadian economy. It is clearly the most important factor behind the substantial increase and changed direction of Canadian export trade—behind the fact that Canada in 1950 was shipping 65 percent of her exports to the United States market as compared with 36 percent of a much smaller volume in 1925. This development is portrayed in chart 2,

which also shows the increase in quantity of Canadian exports of individual commodities particularly affected by larger United States demands. There can be little doubt about the pervasive influence of the developing needs of the United States economy on the growth and pattern of Canadian business.

The shape of things to come as outlined by the Paley report suggests that the impact of United States demands on Canada from 1950 to 1975 will be at least as great as in the last quarter century. Canada has the materials the United States needs—the base metals, the aluminum or "packaged power," the iron ore, the uranium and other "new" metals, the pulp and paper, and the lumber. Her location gives her a major advantage in competing for the United States market, and from a strategic viewpoint she is considered by the United States the most secure source of supply outside of American borders. More than that, the Canadian economy is regarded with confidence by Americans—the result of a long and rewarding investment experience, a comparatively free economic system and a strong currency.

The prospective large increase in United States consumption and imports of many key materials is, of course, a prime element of strength in their long-term market outlook. When to United States demands are added notably larger demands from other countries in the free world—the result of increasing industrialization, rising population, and gradually improving living standards—it becomes clear that a much larger production of basic materials will be required to meet expected demands a quarter century hence. In chart 3, the targets set up by the Paley report for the production of certain commodities in the free world outside of the United States in 1975 are shown in comparison with actual output in 1950. These targets give a vivid impression of the extent of the increases in production necessary to meet the rising import requirements of the United States and the developing needs of the rest of the free world. They indicate that production of copper, lead, zinc, nickel, and iron ore in the free world outside of the United States will have to be approximately twice as big in 1975 as in 1950, and that much larger increases in aluminum and petroleum will be required. On the other hand, they envisage smaller increases for rubber and tin.

The remarks that follow are intended to bring out some of the implications of the Paley report for certain individual commodities. For reasons of space the discussion is confined to a few leading Canadian exports; some commodities which are or will be important to Canada are not even mentioned. The Review is in no sense a summary of this massive, thought-provoking, and sometimes controversial document, nor even of its implications for Canada.

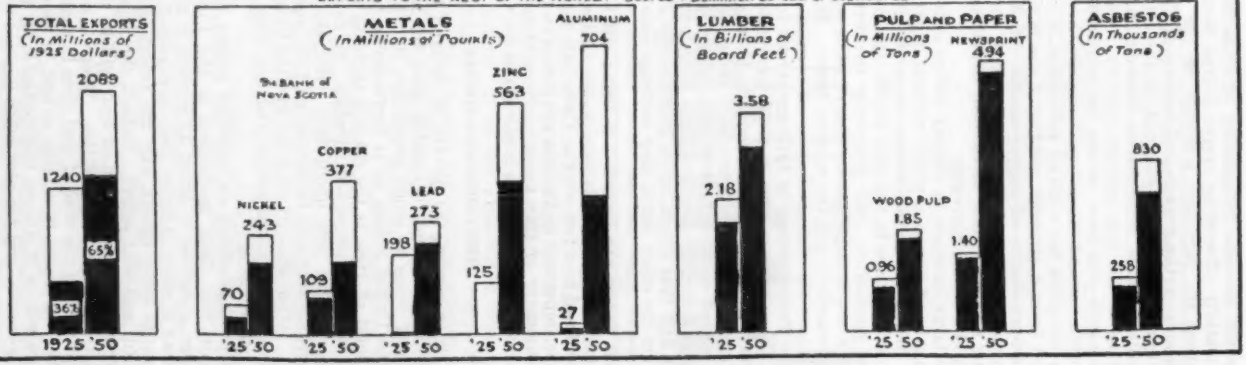
THE OLDER BASE METALS

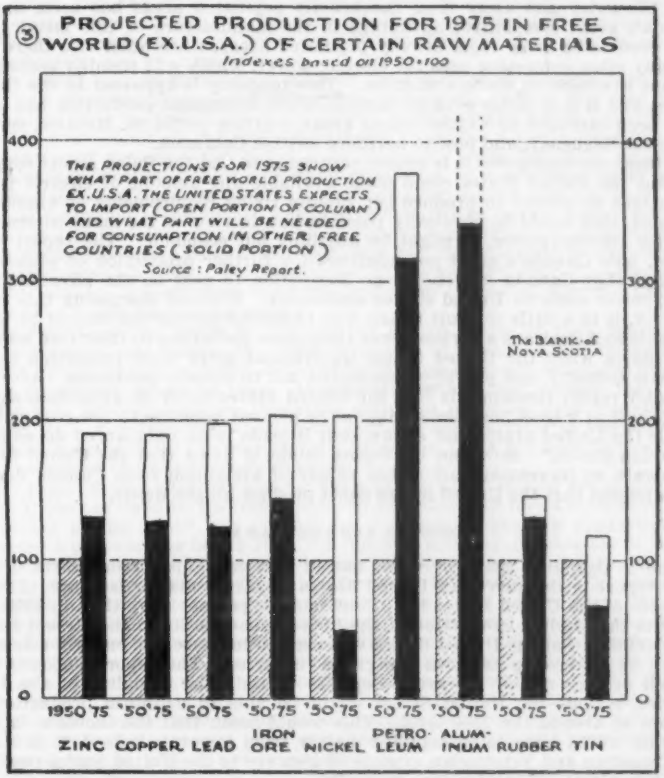
As seen by the Paley report, the picture of demand in the seventies is good for copper, lead, and nickel, and reasonably good for zinc. In each case it is estimated that almost twice as much production will be needed from the free world outside of the United States as is forthcoming today. Most interesting from a Canadian point of view is the marked increase expected in the dependence of the United States on imported supplies. So far as nickel is concerned there is, of course, nothing new about this. But the striking change is the prospect of an American economy importing half its copper and zinc and three-quarters of its lead. After all, only 15 years ago the United States was virtually self-sufficient in these three commodities and not long before that she was a major exporter of two of them.

Increased American dependence on imported copper and lead reflects particularly the expectation that their production in the United States will not be sustaind. For copper, a decline of about 12 percent is anticipated between now and 1975 and for lead a much sharper drop is expected. United States output of zinc may increase to some extent, and the report suggests that zinc should be relatively plentiful and lead scarce. Indeed, the report doubts whether the target it sets for free-world production of lead will be met and thinks that its price may rise relative to other commodities. There is now believed to be much less room for substitution in the case of lead than in that of zinc or even copper. Lead has already been replaced to a large extent in some of its many uses but its unique properties render it almost indispensable in storage batteries, as an antiknock agent in gasoline, and for protection against radioactivity.

② GROWTH IN VOLUME OF CANADIAN EXPORTS FROM 1925 to 1950 : TOTAL AND CERTAIN MATERIALS

SOLID PORTION OF EACH COLUMN SHOWS EXPORTS TO THE UNITED STATES AND OPEN PORTION SHOWS EXPORTS TO THE REST OF THE WORLD. Source : Dominion Bureau of Statistics




③ PROJECTED PRODUCTION FOR 1975 IN FREE WORLD (EX.U.S.A.) OF CERTAIN RAW MATERIALS
Indexes based on 1950=100
THE PROJECTIONS FOR 1975 SHOW WHAT PART OF FREE WORLD PRODUCTION EX.U.S.A. THE UNITED STATES EXPECTS TO IMPORT (OPEN PORTION OF COLUMN) AND WHAT PART WILL BE NEEDED FOR CONSUMPTION IN OTHER FREE COUNTRIES (SOLID PORTION)
Source: Paley Report.
400
300
200
100
0
THE BANK OF NOVA SCOTIA
1950 '75 '50 '75 '50 '75 '50 '75 '50 '75 '50 '75 '50 '75 '50 '75 '50 '75 '50 '75
ZINC COPPER LEAD IRON ORE NICKEL PETRO-LEUM ALUM-INUM RUBBER TIN

However, substitution is still regarded as an important factor in the outlook for zinc and copper. Competition from aluminum has been vigorous. Aluminum diecastings in place of zinc, aluminum wire instead of copper for transmission of electricity—these are examples of a process of substitution which still appears to be gaining momentum. The substitution of aluminum accounts largely for the comparatively modest increases in the projected United States consumption of the older base metals—increases which, ranging from 39 percent for zinc to 53 percent for lead, compare with a projected overall rise in United States materials consumption of 64 percent.

"PACKAGED POWER"

In contrast to the older base metals, the report regards the prospective demand for aluminum as expanding very rapidly. Its projection of United States demand for 1975 is 4 times the 1950 level, and demand from the rest of the free world is put at 5 times the recent level. The report points out that the possibilities of substituting aluminum for wood and steel are potentially much more important than those of further substitution for copper, lead, and zinc. If such replacement should occur to a significant extent in the next 2 decades, United States demand for aluminum in 1975 could be 10 times the 1950 level. Aluminum's power to compete has increased very substantially, its price being almost the same as before the war, while those of steel, copper, lead, and zinc are from 80 percent to 200 percent higher, and that of lumber is more than 4 times prewar.

The limiting factor in the output of aluminum is the availability of cheap electric power in large amounts, for supplies of bauxite are regarded as quite adequate to meet much larger demands. Availability of big hydro power sites

near tidewater and away from the heavily populated areas has been, and is, Canada's great competitive advantage in the manufacture of this metal. The sites need to be away from heavily populated areas, since otherwise there will be many other competing uses for electric power, which will steadily reduce the amount available to make aluminum. This tendency is apparent in the United States, and it is a factor even in Canada, where aluminum production has gradually been extended into more remote areas, starting in the St. Maurice, spreading to the Saguenay, and now to northern British Columbia.

In these circumstances it is rather surprising to find the Paley report suggesting that the United States could make available any amount of electric power that might be needed to produce her rapidly rising requirements of aluminum. No doubt, this would be physically possible, but, in view of the many alternative uses for electric power, it might be anything but economic. The report does, indeed, note Canada's great potentialities for further production of aluminum, but says that Canada has shown no disposition to pass on the advantages of lower power costs to United States consumers. Without discussing this point in detail, it is a little difficult to see why Canadian production should be made available to Americans at prices lower than those prevailing in their own market, particularly when the United States Government gives tariff protection to the domestic industry and provides substantial aid to certain producers. Actually, the Paley report recommends that the United States tariff on aluminum should be retained at a level "neither so high as to prevent recourse to low-cost sources outside the United States, nor so low that it leads to an unbalanced dependence on foreign plants." However, the report thinks it likely that the United States will obtain an increasing part of her supply of aluminum from Canada despite the statement that the United States could produce all she needs.

IRON ORE AND THE SEAWAY

From a Canadian point of view, one of the most interesting parts of the Paley report is the survey of United States requirements for iron ore. It puts the needs of the United States in 1975 at some 50 percent more than in 1950. It points to the gradual exhaustion of the high-grade deposits in the Mesabi Range and concludes that the United States will need to increase her imports markedly as well as to develop her own low-grade resources. The report suggests that through greater use of low-grade deposits—mainly the taconites of the Lake Superior region—the United States might be able to maintain production of iron ore at around the 1950 level. This would mean that the increase in consumption would have to be supplied mainly from imports; indeed, it is stated that Canadian and Venezuelan exports of iron ore to the United States could by 1975 approximate 65 million tons annually.

The Paley report places a great deal of emphasis on Canada as a supplier of iron ore, both for economic and for strategic reasons. Though it looks to Venezuela for notably increased supplies, it clearly regards Canadian sources as vital. It goes so far as to advocate strongly the early construction of the St. Lawrence seaway as a means of making Quebec-Labrador ore more accessible to the steel mills of the central area of the United States, and, indeed, envisages a supply of as much as 40 million tons per annum from that one source 25 years from now.

The report observes that relocating the United States steel industry to fit the changing pattern of ore supply would be far more difficult and expensive than bringing new ore to existing plants in the central area. "Capital expenditures for beneficiating Lake Superior taconites, and for the mining development and transportation system for Quebec-Labrador ores, including the St. Lawrence seaway, and for the transportation and development costs of foreign ores, principally Venezuelan, may total $5 billion in the next 25 years. In that time, the steel industry of the United States will consume 4 billion tons of iron ore to produce steel ingots worth $200 billion. This sum would appear to justify the capital outlay required."

FOREST PRODUCTS

Though the Paley report does not look for such a pronounced growth in the demand for forest products as in that for minerals, it foresees a serious problem of shortage in the years to come—a problem which can only gradually be overcome by scientific policies of forest management and improved techniques of utilization. The report estimates that United States demands for industrial wood (all forest products except fuel wood) will increase by 34 percent in the next 25 years and suggests that those of the rest of the free world will rise by

45 percent. On the other hand, "unless extraordinary measures are taken to build up forest productivity in the more advanced countries and to expand production in the underdeveloped countries," free-world production over the quarter century might rise by only 4 percent.

The report sees no prospect of making good more than a small part of the difference between projected consumption and production in the free world by imports from the Iron Curtain countries. Such imports, which recently have been about one-sixth of the 1935–38 average, could not account for more than one-quarter of the projected deficit even under the most favorable conditions. The pressing question is how to expand production in a relatively short period of time—it takes 50 to 80 years to grow trees for lumber and 15 to 40 years to grow pulpwood. The report warns that overcutting would merely postpone the crisis and recommends most strongly the implementation of scientific forest management—selective cutting, new planting, and fire and epidemic control—on the widest possible scale. For the United States in particular it suggests that a great increase in production could be achieved by correcting wasteful practices both in the woods and in the mills.

The report goes so far as to say that the United States by these means, and by drawing on her remaining virgin resources of timber, could increase her lumber output enough to be self-sufficient by 1975, even though demand is expected to be 10 percent larger by then. It suggests further that, though the United States will have to continue importing pulp and paper on approximately the present scale, her domestic output could increase enough to cover the 50-percent increase in demand that is anticipated. However, these are possibilities rather than estimates of what is likely to occur.

The report makes some interesting observations about raising the productivity of the forests of Canada, the free world's leading source of forest product exports. According to the report, the outlook for increasing Canadian production and exports of pulpwood is better than for lumber; much of the country is too far north to produce trees of the larger sizes. Good pulping species are predominant in the composition of Canadian forests, while only about 25 percent of presently accessible timber consists of saw timber. The report warns that Canada appears to be "overcutting to a substantial degree" and estimates the current rate of net drain on the accessible productive forests at 28 million cubic meters a year, a figure arrived at by computing the growth rate at 87 million cubic meters, fellings at 90 millions, and losses from fire, diseases, and insects at 25 millions. It recognizes the relationship between prices and adequate conservation, stating that only since about 1940 has the price structure for forest products reflected all the real costs of production including those of protection and regeneration, as well as of logging, milling and transportation.

Even these brief comments make it apparent that the Paley report envisages very favorable long-term prospects for a number of important Canadian commodities. There can be little doubt that growing United States requirements will promote and facilitate Canadian resource development and that, in an unsettled world, strategic considerations will place special emphasis on Canada as a source of supply. In these circumstances, Canada is bound to look toward the United States market, and it seems highly probable that the proportion of Canadian exports going to the United States will remain at more than half and perhaps rise as high as two-thirds. From one point of view, this means increasing Canadian dependence on the United States market. But it also means increasing United States dependence on Canadian sources of supply. Though there will in the future undoubtedly be periods of declining United States demand for Canadian products, it is most improbable that the United States will ever again, as she did in the early thirties, find it possible almost to do without Canadian supplies of many basic commodities.

In other words, Canada, with resources which are needed, should over the years enjoy a satisfactory trading relationship with her great neighbor. Canada may well be able to bargain more effectively for better terms of entry into the United States market for the processed and fabricated forms of the basic commodities which the United States requires, but often prefers to take in their primary forms. In such circumstances, Canada should also be able to pursue increasingly effective policies of resource conservation—a point which the report stresses and about which it puts forward many useful proposals and suggestions.

[From Management Review, March 1953]

MATERIALS: A CURB ON EXPANSION?

In America's constant struggle to improve living standards, to keep its economy steadily expanding, and, simultaneously, to hold international aggression in check, one great problem cuts across all of our future prospects. That is the crucial materials problem.

The United States is using a staggering amount of material every year: about 2,700 million tons in 1950. Our resources are not keeping up with the drain; some 25 years from now our economy probably will require some 4 billion tons of materials per year. "The nature of the problem," says the report of the President's Materials Policy Commission, "can perhaps be successfully oversimplified by saying that the consumption of almost all materials is expanding at compound rates and is thus pressing harder and harder against resources which, whatever else they may be doing, are not similarly expanding."

The outlook is a grim one: soaring demands, shrinking resources, and the consequent pressure toward rising real costs. The problem is not that we will have no more iron, or copper, or other basic materials, and that economic activity will suddenly run down. The essence of the danger relates to the real cost of materials—the hours of human work, the amount of capital needed to bring a pound of industrial material or a unit of energy into useful form. We face the threat of having to expend more in labor and in capital to win equivalent amounts of materials from resources which are dwindling in both quantity and quality.

The question naturally arises: Is there any evidence that the real costs of materials are rising today? Between 1940 and 1950 raw materials prices rose about 20 percent more than the average of all other prices. Since then, there have been both great rises and subsequent falls. This above-average rise in materials prices should give us genuine concern.

One obvious approach to the materials problem—finding new domestic sources of materials—requires that we improve our knowledge of what materials we possess. Geologists tell us that the United States probably still possesses many large deposits of familiar minerals that have not yet been found. However, these are deep deposits, or at least hidden deposits that do not have outcroppings. To find them, we need new laws to permit profitable, large-scale search; to take advantage of them, we must improve our methods of recovery and extraction, cut the cost of handling low-grade materials, and get more energy from each unit of our fuels.

Another approach—making better use of old and new materials—brings forward more jobs for technology: putting abundant raw materials to work as substitutes for the scarce, producing new synthetics, and exploring the qualities of many materials now unused. The jobs technology should do are, in fact, endless; the jobs it can do, however, are sharply limited at present by our shortage of trained manpower. We must take steps to see that we train more technicians, and we shall need also to make sure that our research is directed toward solving first problems first.

Of the many major tasks which industry must undertake if we are to mitigate the pressure of scarcities, perhaps the most important is long-range planning. No longer can we afford to let materials problems work themselves out at a leisurely pace; if more or less permanent scarcities or higher cost may plague an industry, its managers need to know about it well in advance. One answer to the planning problem might be for groups of companies and representatives of industries to band together in organizations for long-range research on the future of materials that affect their businesses. Inter-industry groups need to do continuously for themselves the kind of study that the President's Materials Policy Commission attempted for the entire economy. This is not a job that can be done once, and then forgotten; it must be carried on day by day and year by year.

If we develop enough concern for the future, enter vigorously into long-range industrial planning, and press for political action as necessary, our living standards will rise, our economy will grow and prosper, and we shall have the military might to guard our freedoms.—WILLIAM S. PALEY, Commerce, November 1952, page 21:7.

[From the Atlantic Monthly, March 1953]

SQUEEZED

NATIONALISM AND RAW MATERIALS

By Edward S. Mason [1]

A fair appraisal of our raw materials prospect should occupy a middle ground between lamentations of the plundered planet variety and the Pollyanna optimism of there's plenty more where this here came from school. Our planet has too often been plundered, but a wise use of our remaining resources will still make it possible to meet our raw-materials requirements for the indefinite future. There usually is more, but frequently not where this came from or without the difficulty of devising new methods of discovery and development.

The overall resource problem confronting this and every other country is: How are requirements—that is, the benefits from raw materials consumption—to be satisfied at minimum cost? And this overall problem in turn breaks down into two subproblems: How are the raw materials requirements necessary for economic growth to be met? And how are the special raw materials requirements of wartime to be fulfilled if we are so unfortunate as to find ourselves again at war?

ECONOMIC GROWTH

The report of the President's Materials Policy Commission presents some startling figures on the raw-materials requirements of economic growth. The overall consumption of materials in the United States in 1950 was approximately 5 times the consumption in 1900. If this rate of growth is projected forward, consumption in the year 2000 would be 25 times that of 1900; and consumption in 2050, a century hence, would be 125 times as much as we consumed a half century ago.

There are, fortunately, some reasons for believing that, even if economic growth continues at the 3 percent per annum rate we have experienced for the last century, raw materials requirements will increase at a less rapid rate. Nevertheless, the future needs for raw materials will be stupendous. It is a sobering thought that the world's consumption of minerals in the period between the wars probably exceeded the previous total consumption of mankind throughout recorded history.

Economic growth, which means simply an increase in output, is made up of two components: population increase and increase in per capita output. It has been calculated that if the population of the United States should continue to increase at the same rate as it did in the half century 1800–1850, there would be by the middle of the 24th century but 4 square yards per person for the unfortunate future American citizenry. Since population density in this country is relatively low, it is easy to see that, the world over, spatial considerations if nothing else must, at some not very distant date, set limits to population growth.

It is conceivable that, with the development of atomic and solar energy, the extraction of foodstuffs and minerals from sea water, and other Buck Rogers possibilities that are likely to become probabilities, the per capita growth requirements of a relatively stable population might be satisfied for a very long period of time. In any case, speculation on situations as remote in time as these have no relevance for what needs to be done here and now.

OUR DOMESTIC RESOURCES BASE

In the here and now we face a situation in which continued economic growth means an overall materials requirement for 1975 some 50 to 60 percent larger than at present. Particular materials such as aluminum, titanium, and magnesium will, of course, show growth rates much larger than this. On the other hand, the consumption of tin may remain stable or actually decline.

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[1] A Harvard economist, Edward S. Mason has been dean of the graduate school of public administration since 1947. In addition to his teaching, he was on call as an economic consultant to the State Department in 1946 and 1947; and more recently has served as chairman of the Research advisory board of the CED, and as a member of the Materials Policy Commission, which made an exhaustive survey of raw materials the world over and of what nationalism is doing to the free flow of these raw materials in the free world.

To some people the fact that we have met our materials requirements at continually declining unit costs indicates that we will continue to meet these requirements indefinitely at declining unit costs. If the figures on economic growth mean anything, however, it is that the situation we confront tomorrow will differ materially from the situation we confronted yesterday. There are, moreover, certain facts suggesting that our resources base—what we have in relation to what we need—has been subject, over the last 2 decades, to substantial erosion. One of these facts is that this country, which before World War II was a large net exporter of materials, has become a substantial net importer. A second factor is that for United States minerals production, including oil, the unit cost of discovery and development is increasing rather than decreasing. A third fact is that for a number of important domestically produced minerals no really large discovery of ore bodies has been reported for a long time.

The change in the United States position from net exporter to net importer, highlighted in the materials report, has received extensive comment from the press. And inevitably a lot of this comment has been highly exaggerated and misleading. The United States is pictures as a former "have" country now unfortunately become one of the "have nots." In Britain, Aneurin Bevan, no friend of the United States, envisages us as having exhausted our own resources and reaching out to exhaust the resources of the rest of the world.

Nothing could be more misleading. We shall, it is true, if conditions are favorable, become a net importer of materials on an even larger scale than at present. By 1975, if the projections of the President's Commission are at all realistic, we shall be importing some 20 percent of our total raw materials. But this dependence on foreign sources of supply could be largely, if not entirely, eliminated if it seemed desirable to do so. It is not in the interest of the United States, however, or of countries which export raw materials, that this normal increase in imports be arrested.

In general there are two ways of meeting the increasing demands for the materials required by a fixed geographical base. The one involves a cultivation of sources of supply outside this area. The other involves the development of new and improved techniques of discovery, extraction, cultivation, and use of materials within the area. Foreign trade and technology are the keys that will fit this lock. The implications of both for the raw materials situation confronting the United States need examination.

NATIONALISM ON THE MARCH

Taking the free world as a whole, continued growth in the incomes of constituent countries requires a balanced expansion of primary and secondary production; of raw materials and of manufactures. The kind of expansion achieved during the 19th and early part of the 20th century involved a heavy geographical specialization. Certain countries became very large net exporters of manufactured products, others of raw materials. Frequently the raw-materials specialists concentrated heavily on one or a few materials subject to all the fluctuations that beset internationally traded commodities. Banana republics and tin dictatorships were likely, in consequence, to be as unstable as the prices of the commodities they exported.

Almost continuously, furthermore, from 1875 to 1940 the terms of international trade moved against raw materials exporting countries. It required an increasing volume of their exports to pay for a given volume of imports. The Western European colonial powers added the weight of governmental proscription and discouragement to the economic forces handicapping industrial expansion in raw materials producing areas. No wonder resource countries have revolted.

Those days, it need scarcely be said, are gone forever. Colonial Asia barely exists. The rule of colonialism in Africa has been heavily reoriented toward the interests of the governed. The so-called economic colonialism of Latin America is rapidly becoming a thing of the past. Nationalism is on the march throughout the raw materials producing areas of the free world. The paramount economic slogan of these new nations (and most of the old ones) is "economic development," and economic development is almost everywhere interpreted to mean industrialization.

What is all-out industrialization likely to do to the balance in the free world of primary and secondary production, and to the interests of those areas—notably Western Europe, the United States, and Japan—that are, or are rapidly becoming, heavy net importers of raw materials? The consequences—let us make no mistake about it—could be very serious. If the densely populated industrial

countries heavily dependent on exports of manufactures to produce needed foodstuffs and raw materials are forced to depend much more extensively on the cultivation of their own limited natural resources, the result may be not only a decline in standards of living but fairly large-scale, and perhaps forced, migration.

IS INDUSTRIALIZATION THE ANSWER?

The industrial countries of the world are vulnerable to this threat in varying degree. The United States, for reasons suggested above, is relatively invulnerable. We are still net exporters of foodstuffs and could enlarge our food production greatly with little increase in the agricultural labor force. Although exclusive dependence on domestic minerals production would inevitably increase costs, this increase for our most important imported minerals would be relatively slight. Other industrial countries, however, are in a different position. Difficulties in obtaining foodstuffs and raw materials tend to make the resumption of so-called East-West trade with Russia and her satellites even now extremely attractive to Western Europe and Japan. Further impediments to the expansion of output of raw materials in resource countries could present Western Europe and Japan with a nearly insoluble problem.

Although the industrialization of raw materials exporting countries could create a serious problem for manufacturing countries, it need not. And if the interests of resource countries are clearly perceived, it will not. The United States, up to the most recent decade of its history, stands as an example of a highly industrialized country that yet remained a net exporter of raw materials. For nearly half a century our country was simultaneously the world's largest producer of manufactured products and the largest net exporter of raw materials. Even now the United States is a net exporter of foodstuffs though less than 20 percent of the labor force is employed in agriculture.

The way to a simultaneous industrialization and expansion of raw materials exports lies, of course, in improvements in technology. In many of the resource countries, close to 80 percent of the labor force is engaged in a mere feeding of the population. Unless and until methods are found of raising per capita productivity in agriculture, manpower cannot be found for employment in industry no matter what industrialization policies are followed. Frequently the appeal of industrialization to underdeveloped areas lies in a comparison of industrial output per man using Western methods with agricultural output per man using local methods. A comparison, however, of local agricultural output per capita with Western agricultural output per capita yields the same discrepancy. It is not only industrial techniques that need to be introduced, but also agricultural techniques—both modified, of course, to suit local conditions. If both can be accomplished, it will be found that expansion of manufactured output is by no means necessarily incompatible with expansion of raw materials exports.

A BALANCED EXPANSION

An expansion of minerals exports, in particular, is not only compatible with industrialization but frequently a necessary step prior to industrialization. Foreign capital is available for minerals expansion, which means that local capital can be reserved for other uses. Minerals development requires the construction of auxiliary facilities such as port installations, roads and railways, and powerplants. These facilities can and usually do contribute to general development. Minerals production involves only a small diversion of labor away from other uses. The foreign exchange yielded by minerals can be utilized to purchase abroad equipment needed for industrialization. The prime illustration of this process is Venezuela, whose minerals exports yield 97 percent of her foreign-exchange receipts, furnish 60 percent of Government revenues, provide important auxiliary facilities, and yet divert less than 5 percent of the country's labor force away from other employment.

A proper balance between raw materials and industrial expansion is of vital importance to resource countries. It is also of paramount importance to economic growth in the whole of the free world. What is needed is an encouragement to foreign private capital to do what foreign capital and enterprise can do best; technical and capital assistance to both agriculture and industry in resource countries; a freeing of barriers to trade; a handling of the security problem that embraces opportunities rather than merely imposes restraints. A whole set of complex but not insoluble problems is necessarily involved in the achievement of a satisfactory balance.

The foreign raw materials policy of the United States thus embraces more than ways and means of satisfying our raw materials erquirements at minimum cost. Success of our security policies, both in Western Europe and in Japan, is closely related to the way their raw materials problems are solved. The United States could certainly survive a loss of foreign sources of raw materials supply. Whether the system of relations among countries we regard as necessary to our security could survive is a different matter.

TECHNOLOGY AND NATURAL RESOURCES

One way, then, of meeting the problem of a dwindling resources base is to turn to outside sources of supply. The other possibility is to find new ways and means of using what we have. If low-grade ores hitherto unexploited can, through scientific and technological advance, become commercial; if uses can be found for minerals hitherto unused; if plentiful materials can be substituted for scarce; if scrap can be reclaimed; if land in inferior use can be transferred to superior use; if water resources hitherto unusable now become useful, we will have succeeded in expanding our resources base. This is largely a task for science and technology.

Scientific and technological advances in the discovery and use of natural resources have, of course, been operating in this direction for a long, long time. It is an interesting question, however, why one nation occupying an area with certain resource potentialities will effectively develop and enlarge the flow of resource services while another nation, occupying an area with similar potentialities, will not. It is not simply because one country has brains that the other lacks. The primary explanation has to do with differences in social structure, in political and economic institutions, in public policies and the relations of government to business that succeed, or do not succeed, in channeling the talents of the population into a successful conquest of nature.

These differences can influence both the rate of scientific and technological innovation and the speed at which innovations are put to use. The expansion of yields on the corn lands of the United States was the product, not only of the development of hybrid strains, but of the rapidity with which these new developments were applied on millions of farms. Expansion of our domestic resources base through scientific and technological development involves both innovation and dissemination.

Our free-enterprise system, with its millions of decision-making units motivated by desire for profit and fear of loss, is an admirable mechanism both for stimulating innovation and for adopting innovations once their utility has been demonstrated. This mechanism is dependent mainly on the schools and universities for a continuing flow of trained scientists and engineers. Scientific and technological discovery is the result not only of work in industrial laboratories, but of governmental and university research. The dissemination of new techniques can be, and is, assisted either by positive governmental programs such as the agricultural extension service or by the provision, through appropriate government action, of an environment favorable to the operation of private enterprise. Given sensible arrangements and policies, the native talents of our people and the drives provided by an enterprise system can be relied on to get the job done. Sensible arrangements and policies involve questions that primarily concern the relation of government and business. To a lesser extent they also concern the relations of both government and business to the Nation's schools and universities.

GOVERNMENT VERSUS PRIVATE ENTERPRISE

American scientific research is neglecting pure science in favor of its applications. The current flow of engineers from our universities is pitifully inadequate for the engineering tasks that lie ahead; and of this inadequate flow of scientists and engineers, a still more inadequate percentage is going into the earth sciences and the metallurgical pursuits on which the effective use of natural resources essentially depends. A reorientation of research and training programs is therefore badly needed. It is, moreover, a task that cannot be shouldered exclusively by the universities; it is mainly up to government and business to provide the financing of scholarships and research—above all, of pure research—without which the universities are powerless to perform their function.

When we turn from the training of manpower and the area of pure research, which basically belong to the universities, to technological applications, the burden falls primarily, though not exclusively, on private enterprise. Not exclu-

sively because in certain areas, such as agriculture, the size of the business unit is too small to permit effective research into new methods of land use, plant and animal breeding, and the like. Government research also has a role to play in areas in which the national interest requires search for new sources of materials supply long before commercial motivations begin to operate. Government experimentation in synthetic fuels, low-grade iron ores, the recovery of manganese from slag, may be cited as examples. Finally, the tremendous expansion of government buying, particularly for military needs, has opened up a fruitful field of Government materials research. Very large opportunities for materials savings through the substitution of plentiful for scarce resources lie relatively unexplored. When all this is said, it still remains true that the principal responsibility for scientific and technical applications relative to the expansion of our resources base lies in private hands and should remain there if our enterprise system is to function effectively.

In spreading the use of scientific and technological innnovations it is clear that Government has a minor, though important, role to play, as exemplified by the Agricultural Extension Service, and a major role to play in channeling effectively the drives and motivations of private enterprise. It is of little use to devise new methods of mineral exploration—the airborne magnetometer, for example—requiring exploration rights over large areas, if public lands are in fact only open to prospectors in plots whose size is adapted to pick-and-shovel operators. A change in public policy concerning mineral exploration on public lands is essential to the dissemination of technological improvements.

Improved forestry practice designed to provide a continuous cropping of forest lands has been widely disseminated in the United States on public holdings and on private holdings of a size sufficient to make these methods pay. Two-thirds of the forest land of the United States, however, is in small woodlots where desirable practice is not easy to achieve. Public policies assisting the combinative or cooperative management of woodlots can make an important contribution to the spread of sound forestry methods.

The President's Commission reports the principal tasks of technology in the materials field to be: "to foster new techniques of discovery"; "to bring into the stream of use, materials which so far evade our efforts"; "to apply the principle of recycling (reusing) more and more broadly"; "to learn how to deal with low concentration of useful materials"; "to lessen or eliminate the need for a scarce material by substituting one that exists in greater abundance"; "to develop and use more economically the resources that are renewable in nature." Some of these tasks require a devising of new techniques; others will be accomplished through the spread of known techniques to operations that are currently substandard.

NATIONAL SECURITY

In the unhappy event of war, we are likely to be cut off from certain traditional sources of supply. It does not follow from these facts, as commonly supposed, either that, in handling the materials requirements of war, consideration of cost and economy are "out the window," or that, since foreign sources of supply may be vulnerable, we must rely so far as possible on domestic production.

Certain materials should be stockpiled in adequate quantities when opportunity permits. For other materials the best procedure may be to set aside domestic reserves to be exploited only in the event of war. In some cases it will be necessary to create standby facilities. The military requirements for other materials may best be handled by encouraging peacetime expansion of output in safe—but not necessarily domestic—areas. To a considerable extent these possible lines of action offer alternatives. The guiding principle of public policy must then be, as it is in the meeting of materials requirements for peacetime economic growth, to provide adequate availability at minimum cost. If materials preparations for the eventuality of war are properly handled, we shall not only have provided ourselves from lowest-cost sources but shall have eliminated the necessity of a large-scale diversion into raw materials production in wartime of resources better employed at or immediately behind the battle front.

The security argument is nevertheless frequently and heavily used to justify the protected expansion of domestic sources of materials supply. When expansion of domestic output is the cheapest way of assuring adequate supplies of materials in the event of war, the argument is a sound one. As we have seen above, however, there are many other ways of attaining this objective, and a sensible public policy will compare the costs and benefits of domestic expansion with the costs and benefits of other routes.

The security policy of the United States, moreover, raises important additional doubts concerning expansion of domestic output as the preferred route to adequate materials supply in the event of war. The cornerstone of this policy is a system of alliances. If the requirements of our allies have to be taken into account—and this is elementary—shall we prepare for war contingencies by increasing the current drain on our already heavily exploited resources base, or is it better to attempt to meet allied requirements by expansion elsewhere?

Furthermore, the peacetime economic relations that make cooperation in the event of war possible consist largely of relatively unimpeded access to markets and to sources of supply. Only if countries which export raw materials can count on a continuing import of their products by other countries, and a continuing access to sources of manufactured products, will the economic basis for a mutual security arrangement persist. An attempt by the United States to push materials security by expanding domestic output at the expense of foreign sources of supply might very well end by destroying the cornerstone on which our whole security policy rests.

It can be seen, then, that although security considerations create a new set of materials problems for which special action is required, these considerations neither involve a departure from the general principle of meeting our requirements, however defined, from lowest-cost sources, nor favor an all-out expansion of domestic production at the expense of foreign sources of supply.

The United States and the rest of the free world confront a materials problem, first, because of the very great increase in materials requirements associated with economic growth; and, second, because of the necessity of not only meeting these requirements but preparing at the same time for the eventuality of a hot war. The difficulty is not that we may run out of materials, but that a meeting of requirements may involve a continued increase in unit costs. Economic growth in the past has depended on a persistent downward trend in the costs of both material extraction and fabrication.

The difficulties can be successfully met if the United States and the rest of the free world can draw freely on lowest cost sources of supply and if improved ways of using our physical environment continue to be discovered and disseminated. The former solution lies largely in the field of international economic relations, the second in the area of domestic institutions and of public and private management.

[From Challenge magazine, April 1953]

Our Greatest Danger

By Morrison Colladay

This danger, admittedly, isn't dramatic. It's not like the possibility of being wiped out by atomic bombs. It hasn't affected our everyday living—yet.

Right now there's no shortage of goods such as electric irons, baseball bats, or milk. But if we go on wasting our natural resources, eventually we won't have enough of them to go around.

Water, oil, iron, lumber, and soil make up most of the wealth nature has put at our disposal. They underlie our economy; they keep our factories humming. If lost, water, lumber, and soil may be replaced—at heavy cost and with years of work. If our minerals run out, however, they'll be gone for good.

We're draining these supplies steadily. Fifty years ago we produced about 15 percent more raw materials than we consumed (except food). This year we're consuming about 10 percent more raw materials than we produce.

Another glaring fact of our economic life is that the United States—with about 9.5 percent of the total population and about 8 percent of the total land area of the free world—eats up about 50 percent of the free world's volume of materials.

So far, as a nation, we've shrugged off these facts. That's why informed people such as Louis Bromfield become violent.

"There are times," says Bromfield, "when the human race seems scarcely civilized at all and possessed of a mentality little above that of the Java ape man."

Authorities such as Fairfield Osborne and William Vogt, equally concerned but more restrained, have been doing vigorous missionary work during recent years to arouse people about what is happening to our land and water, our forests and minerals.

Probably the main reason for the average American's indifference is that he retains the attitude of his pioneer predecessors. The country was as big as their

imaginations. When farming land in the East became worn out, it was always easy to go West and cultivate virgin soil. America to them was an inexhaustible treasure house of forests, iron, coal, copper, silver, gold, and oil.

But today, having developed over the years from an agrarian to a highly mechanized industrial type, our economy has outgrown its resource base.

Here are the facts—and they apply to most of the rest of the world, too.

What about water?

Most of us had never thought of water as a natural resource that might be failing, until the drought of 4 years ago made us cut down on consumption in New York and elsewhere.

Even now, we don't realize how serious it is that the water table—the water level under the surface—has been getting lower and lower year after year, because we are using more water than the rains and snows replace.

Recently, the Department of Interior announced that around Newark, N. J., the water table had sunk more than 200 feet. "A survey by geologists," says the report, "shows the situation to be near the critical stage."

In a Pennsylvania city not long ago, plans for a new factory had to be abandoned because the entire available water supply was being used.

This is Dr. Ogden S. Jones' warning to the American Society of Civil Engineers: "A consistent decrease in the Nation's water supply may necessitate its strict rationing. If conditions do not improve, in the not too distant future the economic growth and industrial expansion of this country will be seriously affected; 75 percent of the springs and shallow wells in the East have failed in the past 50 years."

The serious situation of farmers on irrigated land in the West is duplicated in the towns and villages of the East that depend on artesian wells for their water supply. It is summed up by the well diggers of the Hudson Valley. "The water just isn't there any more," they say.

What about oil?

During World War II, we were exhausing our oil reserves while other nations were carefully husbanding theirs. The oil companies are wide awake to the situation. Active prospecting is being done today in many parts of the country where oil has never been found in the past. As a result, Mississippi, Alabama, and Florida have become producing States.

Prof. E. Willard Berry, of Duke University, suggested—in an address before the Geological Society of America—that oil may be found anywhere along the south Atlantic seaboard, but that drilling will have to go very deep "because layers of sandstone and other rocks extend downward in that area as much as 15,000 feet."

Taking into consideration the prospect of the discovery of new fields, the consensus of expert opinion is that oil production in the United States will be sufficient for the next 20 years, and that oil shales will keep us going awhile longer if consumption continues at the present rate.

What about iron, and other essential metals as well?

In a speech before the National Industrial Conference Board, William S. Paley, Chairman of the President's Materials Policy Commission, warned:

"Unless long-range planning is applied, the United States is in danger of becoming a have-not nation in the next 25 years in such basic materials as iron ore, zinc, copper, lead, aluminum."

In comparison to other parts of the world the United States stands in a poor position as to iron reserves. Up to now we have mined most of our iron ore in the Mesabi Range near the western end of Lake Superior. But this source is dwindling. We'll have to depend more and more upon methods of extracting the metal from low-grade ores. It's not certain yet how good these methods are.

Among the sources of iron ore outside our borders, probably the recent discoveries in Labrador and Venezuela will prove the most advantageous to us. These present special problems, however, such as cost of transportation. Already it's running into hundreds of billions of dollars.

What about lumber?

How long our supply will last at the present rate of cutting is anyone's guess, but we already import more than we export.

The greatest timber stands left are in the Pacific Northwest; yet it was not long ago that two of the largest sawmills in the world located in that region closed down permanently because they could no longer get enough logs to operate profitably.

As Jay N. ("Ding") Darling, famous newspaper cartoonist and long-time fighter for conservation, tells it:

"I have been from one edge of the continent to the other in the old forested areas that have now been cut over," he says, "and that is where you will find ghost towns with schools closed, churches vacated, houses empty and the sawmills and storekeepers and other businesses bankrupt and gone."

The United States Forest Service calls attention to the fact that "the Nation's standing reserve or capital amount of saw timber has shrunk more than 43 percent in the last 38 years, largely because of unnecessarily destructive cutting procedures."

The service is now putting into operation a policy by which it gives to private companies the exclusive right for 100 years to cut timber in the Nation's forests.

The first agreement under this policy was with the Simpson Logging Co. of Shelton, Wash. It involved 158,000 acres owned by the company and 112,000 acres of adjoining national forest timber, establishing "the first Federal cooperative sustained-yield forest-management unit in the United States."

By the terms of this agreement, the company bound itself to cut the timber on its own 158,000 acres only in accordance with approved Government conservation practices. These will provide for cutting only mature trees, removing them without unnecessarily damaging surrounding growth, and in general harvesting only the annual net growth of the unit each year. This way the woods will last indefinitely.

What are the chances of reclaiming eroded, cut-over, and exhausted farmland? They are not promising, because, as Louis Bromfield points out, in this country the wastes are not returned to the soil. "The dominant practice here is that of funneling our mineral and agricultural wealth as rapidly as possible through our great cities by way of sewage and garbage wastes into the sea, thus poisoning our streams and drinking water."

Estimates of the acreage of farmland made useless for agriculture by erosion vary widely, but even the lowest is staggeringly great. No one has tried to estimate the acreage—not necessarily eroded—that has been exhausted beyond the possibility of restoration through fertilization. In a period of astronomical agricultural prices, there are hundreds of farms in the southern counties of New York, for instance, which can be bought for back taxes—because it is impossible for even the most experienced farmer to make a living on them. This condition holds true in many parts of the country.

This destruction of farmland is unnecessary. China has been growing luxuriant crops for thousands of years on the same land without the use of artificial fertilizers. The city of Milwaukee has shown how this country can do the same.

Milwaukee was getting its drinking water from Lake Michigan and at the same time discharging its sewage into the lake. As long ago as 1914, it began experimenting with a system of sewage disposal which had been successful in England. By 1925 it had established a plant which disposes not only of its own sewage but also that of 13 neighboring towns.

The advantage of the Milwaukee system is that the sewage is converted into fertilizer, which the city sells. Unlike most fertilizers, this has no odor, and it is rich in nitrogen, potash, and phosphate. It provides organize matter for the soil which chemical fertilizers do not. Milwaukee christened the material "Milorganite" and receives enough from its sale to pay the expenses of operating the sewage disposal plant.

Chicago, Houston, Miami, Washington, and other cities are either using the Milwaukee system or planning to install it.

As for other countries, a United Nations study recently called the attention of the General Assembly to "widespread soil erosion and loss of land fertility as a major concern throughout the world's non-self-governing territories of some 170 million people."

The United States reported as to Puerto Rico, "It is estimated that more than 25 percent of the upper layer of the soil has been swept away."

Exhaustion of natural resources is a particularly serious problem in Mexico and South America. "The American republics," says William Vogt, Chief of the Conservation Section of the Pan-American Union, "are living on their land capital and unless there is a radical change in land management, they will become bankrupt. Within a hundred years, for example, Mexico will have been largely destroyed."

He lists as the chief reasons for alarm the destruction of forests, overgrazing, soil erosion, the silting up of rivers and floods resulting from upstream misuse of land.

There are equally grave reports on Tunisia, the Belgian Congo, Nyasaland, and South Africa.

South Africa is faced with the same conditions that we find in this hemisphere. The Government became so alarmed that it summoned an American expert for advice—Dr. Hugh Bennett, former Chief of the United States Soil Conservation Service. On the eve of his return, Dr. Bennett made a farewell address to the people of South Africa. What he said applies equally to us.

"The dangers are so great," said Dr. Bennett, "that a few years of merely talking about it, rather than starting a definite national program of soil, water, and veldt conservation, will allow another 25 percent of the substance of life to drift downstream to the ocean. At such a stage, South Africa will have arrived at the unhappy and altogether unnecessary economic status of a decadent nation.

"I believe the strong people who built this Nation will move heaven and earth to save it when they understand the full gravity of the situation."

[From Challenge magazine, April 1953]

UNCLE SAM'S MOUNTING APPETITE

Just last month the U. N. made known that the United States ranks first in the world as a trading center, supplanting Great Britain. We now handle more than one-sixth of all the international traffic borne by ocean, air, and rail.

And during the period in which this has come about, our rate of imports has grown faster than our rate of exports. Bulking heavily in this rise of imports have been raw materials.

Thus the Paley report, the five-volume findings of the President's Materials Policy Commission released last June, continues to take on significance.

This report, which threw a far-reaching light on the problems we face in raw materials supply, has touched off comments and arguments which have opened the eyes of the man-in-the-street to the question as never before. Its recommendations are debated on the next few pages of Challenge Magazine by Andrew Fletcher and Arthur H. Bunker, two of the Nation's ranking authorities.

Looking ahead, the report measured raw materials we would need—total war or no total war—by the year 1975. It based this upon the rate at which we're eating up these materials now.

The Commission pointed out that in mechanizing our economy during the last 40 years we have used up more of most metals and mineral fuels than consumed by the entire world in all previous history!

Headed by William S. Paley of the Columbia Broadcasting System, the President's Materials Policy Commission set to work in January 1951. It was instructed to "study the broader and longer range aspect of the Nation's materials problems as distinct from immediate defense needs," and examine them in terms of military security, civilian welfare, and continued economic growth. It was to give consideration to the needs and resources of other friendly nations. It was to make recommendations to prevent "shortages of materials that would jeopardize national security or become a bottleneck to expansion."

Figuring that by 1975 we'd have 193 million people in the United States with a working force of 82 million, the Commission assumed we would continue expanding our economy by about 3 percent a year.

This meant we would just about double our output of goods and services. In order to do this we'd need 60 percent more raw materials than we use now, ranging from an 11 percent increase in demand for forest products to an average increased demand for minerals of 90 percent.

It became strikingly clear to the Commission, as member Arthur H. Bunker tells it, that in the last 50 years the Nation had changed from a net exporter of materials "on balance" to a net importer. From a net exporter of 15 percent of our production, we became a net importer of 10 percent of our requirements. Even iron and petroleum, of which we'd long been so sure, had followed this trend.

And while our appetite for materials kept growing, our reserves of these materials were sinking in both amount and quality.

Among its forecasts, the Commission said that by 1975 we would need 40 to 50 percent more iron, copper, lead, and zinc, 300 percent more aluminum and 2,000 percent more magnesium. It declared we would depend more and more for these essentials upon other countries. It also said we'd require 53 percent more coal, 142 percent more natural gas, 109 percent more oil and 260 percent more electric power.

Its conclusions, as voiced by Chairman Paley:

Get more materials and more energy from domestic resources at low cost.

Make better use of what we get, and find ways to use new and abundant materials as substitutes for scarce domestic materials.

Import more materials from other nations of the free world on terms that are advantageous to both us and them.

As we suggested, however, serious objections have been sounded to some of the Paley report's data and recommendations. On the succeeding pages experts Bunker and Fletcher have their say, for and against.

[From Challenge magazine, April 1953]

How Can We Insure an Adequate Supply of Mineral Resources for the Future?

Here are both sides of the debate on the Paley report—the findings of the President's Materials Policy Commission on our long-term resources needs.

"Shortages Call for Planning Now," Says Arthur H. Bunker [1]

When the final report by the President's Materials Policy Commission was released last year, the comments in numbers alone were overwhelmingly favorable. However, it became evident at the American Mining Congress meeting in September that there was substantial criticism from the mining industry.

It is not possible here to comment on more than a few of these criticisms. To begin, there was extensive and fundamental objection to the concept of projection of needs over the future. These criticisms ranged from statements that projection in itself was a form of crystal gazing, witchcraft or sorcery, to more moderate views that to assume growth was reasonable, but that the possible variations were so great in the field of technological change, substitution of materials and habits of man that the end results would be completely invalidated. The Commission stated repeatedly that its projections only measured the problem generally.

The Commission started with a conservative estimate of population. It estimated what this population might need in end-products such as automobiles, houses, and home appliances. For instance, in automobiles, we assumed a very slight increase in per capita car population.

We then estimated what "materials mix" would be used to produce these end products. For example, the data on potential copper supply in 1975 suggested a continuing incentive to substitute aluminum for copper. From this it appeared that copper consumption might increase 50 percent and aluminum 300 percent.

Of course, technological changes may have serious effects on many of the estimates, but that should not invalidate the general measurement of demand. We believe forward planning is justified and essential.

In raw materials industries, it is not customary to look ahead for long periods of time. The average mine will feel itself fortunate if it has developed its proven ore reserves 5 years in advance. However, the Commission feels that it is just as necessary to project requirements for raw materials as it is for a municipality to plan for its future population in water supply, schools, highways, or hospitals.

The most violent criticism leveled at the Commission was for its conclusion that something should be done about stabilizing market prices for raw materials.

The Commission examined the wide swings in world market prices over a period of 50 years and concluded that price swings of 100 percent to 400 percent from base to peak created devastating losses to all, producers and consumers alike, retarded production, and produced great waste.

It concluded that it was "clear that economies of all free countries, producers and consumers alike, would benefit if it proved possible to moderate the boom and bust of materials prices."

It examined domestic and international efforts at stabilization and concluded that "commodity agreements of the international buffer stock type held sufficient promise of reducing market instability to merit serious consideration, and efforts

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[1] Mr. Bunker, a member of the five-man President's Materials Policy Commission, is president of the Climax Molybdenum Co. During World War II he was chief of staff of the War Production Board.

to work out, as tests, stabilization agreements with other countries for a few materials."

Industry is on solid ground in assuming that there are no master minds in Government or elsewhere. The last 20 years have not justified great confidence in the age of the planners, or in centralized controls by our national Government. We concur in this view. On the other hand, we think the penalty of not reducing market instability will be a great deterrent to the abundant production of materials.

The mining industry agrees, we believe, that wide fluctuations in prices are a great threat, whether in domestic or foreign operations. It is the suggested method of correction, of course, that disturbs them. Alternative suggestions have been numerous. The industry has suggested it might favor national buffer stocks to be bought and sold under an operation similar to the purchase and sale of Government bonds by the Federal Reserve System. Others have suggested that the Government should establish a floor under prices similar to our agriculture-parity program. There seems to be common agreement that a serious problem exists and that some dampening of violent price fluctuations would benefit all producers and consumers.

There was strong criticism against the Commission's recommendation to repeal the Buy American Act. The Commission held to the principle that future continued economic growth will depend upon availability of materials at no increase in real costs; that is, at no greater outlay of human effort, capital, or other productive energies than in the past. Any increase in real costs will necessarily tend toward stifling growth or to a reduction in our standard of living. Consistent with this premise and with a concept of full employment, the Commission felt that the greatest good of the country could be served by obtaining materials at lowest cost when consistent with national security.

It was particularly heartening to the writer to find that in discussions carried on more fully and quietly, after the open panel discussion at Denver, many of the first apparent differences tended to disappear.

I am convinced that many of our critics would have produced conclusions very similar to the Commission's if they had been charged with the same responsibility; namely, recommending the best solution for the country as a whole over a long course of time. This is different, indeed, from determining how best to make an immediate profit, at a fixed location, over a short period of time.

A basic concept of the President's Materials Policy Commission was that whatever the nature of the industrial tasks before the country might be, they could best be performed through private enterprise, spurred by the profit motive system; but we did not believe that the Government's responsibility in establishing a materials policy should be held at zero.

"THE REAL THREAT LIES IN CONTROLS," SAYS ANDREW FLETCHER[2]

Mining is a one-crop business. Inevitably, our mineral resources must decline with extraction and use. Some day, a long, long time from now, they may run out. But that is problematical, as we know the earth's crust contains all the metals we need in great abundance, even though in some cases the average quantity is extremely small.

The theoretically correct fact that we face exhaustion of the easily mined mineral deposits some time in the future causes our Government officials periodically to peer through their periscopes into the future, mixing their observations with statistical data of purely historical significance, and to burst forth with the most alarming conclusions.

A study of the many forecasts that have been made over the last 50 years or so shows them to have been largely wide of the mark. Most fears of shortages have been proven groundless.

The report of the President's Materials Policy Commission is the most thorough job of mineral forecasting that has ever been done. It deserves unstinted approbation for the constructive approach it makes to many of the serious problems facing the domestic mining industry, in taxes, in the need for incentives to compensate miners for the extraordinarily high financial risk they take, and for the analyses it makes of the impediments to foreign mining investment.

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[2] Mr. Fletcher is president of St. Joseph Lead Co., president of the American Institute of Mining and Metallurgical Engineers, and a vice president of the American Mining Congress.

But the good in the report is unfortunately offset by the impression that the cure for the apparent shortages the Commission forecasts is more Government intervention—not only national but international.

Moreover, the report fails to point out the reassuring fact that shortages have been with us from the dawn of history. It is scarcity that gives anything value. We have always found ways of getting around shortages—either by doing without or by searching for more of the scarce article under the stimulation of the higher prices that shortages always bring or by finding substitutes.

Invariably, when there is a lead shortage, which generally doesn't last long, the consumers move heaven and earth to find acceptable substitutes. They do this so successfully at times that they cause the miner much anguish, especially when the substitution proves so practical it completely displaces lead for a former profitable use. But that is part of the American system. We should not complain because this system has resulted in giving our citizens the highest standard of living in the world.

I regret the use in the Paley report of highly questionable statistical analyses, as when they deal with lead, to build up a case for a shortage and to foster the impression that only Government intervention is the cure. The report forecasts a yearly deficit of lead of 900,000 tons by 1975—"deficit" meaning the difference between what is consumed and what is produced by domestic mines plus recovery from scrap. But the St. Joseph Land Co., using different figures and assumptions, estimates an annual deficit in lead of only 200,000 tons by 1975.

I also disagree with the Commission's recommendations for further drastic impairment of the historical tariff structure needed by our domestic mining industry. We miners function in a heavily subsidized national economy and, realizing the necessity, if only from military considerations, of a sound industry, we cannot subscribe to the Commission's philosophy of the least-cost principle and the sacrifice of the domestic mines.

Moreover, I take exception to the statement that "the Commission is convinced that the solution to the problems of material-market instability must be sought through international agreements, in which the United States will have to take a leading part," and that, in moving toward better controls, special consideration should be given to: (*a*) the multilateral contract; (*b*) international buffer stocks, and (*c*) international buffer stocks combined with limited quota agreements." This focusing of attention on the desirability of negotiating international commodity agreements, popularly known as cartels, is one of the most astonishing suggestions to come out of Washington over the past few years.

The Paley Commission holds up the International Wheat Agreement as a model. Surprisingly few people know that this simple agreement has cost the taxpayers of the United States over $600 million and that through it we are furnishing breadstuffs to some forty-odd nations at lower prices than our own poor can obtain.

The weakness in the wheat agreement and similar plans is that the Government is impotent to stabilize the flow of commodities, even though it be granted enormous power over both producers and consumers. In the exercise of that power, someone in the Government has to decide the stabilized price.

The moment the decision is made, the die is cast. Consumers may not like it. The price may be too high. They, therefore, substitute or refuse to buy. Supplies accumulate. Then the Government steps in to regulate production to the dismay of the producers.

On the other hand, if the stabilization price decreed by the Government is too low, production declines. Consumers become frantic. The Government offers subsidies, or restricts uses, and we are off again on a ride with ever more controls.

All of these schemes reflect a lack of faith in freedom itself, and assumes the citizen cannot be trusted to direct his own life, but must have a guardian to protect him. It is a great pity that so many theorists have succumbed to the economic doctrine of managed economies, managed currencies, and managed markets. If we substituted for the word "managed" the word "rigged," we would be nearer the truth, for what they condemn vehemently in private industry, they would condone under Government auspices.

All the inconveniences caused by the market changes are nothing compared to the results from drastic intervention of Government to cure market maladjustments.

The bewildering aspect of the Paley report is that it endorses free enterprise, and at the some time expresses beliefs, conclusions, and recommendations that point inescapably to move and more Government control of our mineral economy. Our recent experiences since the Korean war, with Government controls of our

metal markets, confirm my belief that controls only result in futility, waste, and unconscionable discrimination.

[From Collier's, April 11, 1953]

How Collier's Grabbed 20 Acres of Valuable Public Land for $1.25

Our outdated mine laws let opportunists seize United States land at bargain prices

(By Bill Davidson[1])

A few weeks ago, Collier's stole 20 acres of valuable land from you, the people of the United States. The tract is in Colorado, in one of the most beautiful national forests in the country. It's covered with lodgepole pine and Douglas-fir trees; it has its own mountain stream, teeming with trout and beaver, and it lies right across a proposed new route of a heavily traveled transcontinental highway.

Collier's paid $1.25 for the land, that is, I did, acting as Collier's agent. No one can now get at the timber, or fish the stream; I have plastered the area with no trespassing signs. If I wish, I can fence off the property as a private hunting-and-fishing preserve. Or I can despoil the scenery by building an ugly hotdog stand, or a souvenir shop or a merry-go-round—anything I want.

I can do more. I can block the highway.

At present, U. S. Highway 6, a key artery between Massachusetts and California, runs right past the property. Farther on, it becomes winding and dangerous, and hard to maintain. The Government wants to reroute it, and a new tunnel has been drilled through the Continental Divide, opening into a valley.

Collier's 20 acres block off the valley from ridge to ridge. If the Government wants to build the road through that valley, it will have to buy up the land at my price, or spend long, expensive months in court to get me evicted.

How can one man cause so much trouble with a measly dollar and a quarter?

It was easy. I merely drove from Denver to the 12,000-foot-high Loveland Pass in the Arapaho National Forest, hiked off the road into the woods and tacked an empty tobacco can to a tree. I stuffed a handwritten notice into the can, and on another tree I nailed up a sign reading "Corner Number One." Then I drove back to the village of Georgetown, the seat of Clear Creek County, and paid the county clerk my $1.25 to record the notice. That's all there was to it. Under our weak, archaic Federal mining laws, my out-and-out steal is a perfectly legal mining claim.

In the 11 Western States and South Dakota, there are 450 million acres of Federal lands subject to the mining laws. An estimated 30,164,000 acres—in area greater than that of Pennsylvania—already have been taken over by private citizens just as I seized my choice hunk of Loveland Pass.

Only 3 percent of this huge area is being used for legitimate mining. Most of the rest has been taken from the people of the United States for other purposes—at the rate of 5,000 new claims every year—in a quiet land-grab unparalleled in our history.

Collier's, of course, filed its claim merely to dramatize the shocking situation and is gladly giving up its 20 vital acres after the publication of this article. But thousands of other Americans had more selfish ends in view.

MINING CLAIMS PUT TO VARIOUS USES

In the Siskiyou National Forest in Oregon, for example, the late author Zane Grey acquired a 32.5-acre mining tract and used it as a private fishing preserve along the lower Rogue River, one of the finest salmon streams in America. In the Helena National Forest in Montana, Mr. and Mrs. William A. Osborne used their mining claim as a mink farm. In the White Sands National Monument in New Mexico, a miner erected a home, a filling station and an auto-repair shop on a tract he called the White Gyp Lode Claim; and in the Coeur d'Alene National Forest in Idaho, Basil Rizzinelli put up a string of saloons on claims just outside legitimate mining camps on United States lands.

One of the most spectacular cases involved a rancher named A. J. Denny, who staked out no less than 597 contiguous mining claims totaling 86,240 acres of

[1] The original research for this article was done by Cleveland van Dresser, a staff member of the Palm Beach (Fla.) Post-Times. Mr. Van Dresser brought the conditions herein described to the attention of Collier's editors after completing a 20,000-mile survey trip throughout the western part of the United States.

fine grazing land (an area as big as the sprawling city of Philadelphia). There are no known worthwhile minerals in his section of Emery County, Utah, but Denny posted the vast area with signs reading, "Private Property, No Trespassing," and he used it as a pasture for 13 years—until finally his mining claims were voided by the Federal Government, and he was separated from his empire.

The United States Forest Service estimates that there are 87,838 such invalid or unproducing claims in the national forests. There are probably an additional 1 million in the public-domain lands, which are administered by the Bureau of Land Management of the United States Department of the Interior. To this total, add the estimated 5,000 new claims every year, most of which must be regarded as spurious.

Do these figures shock you? They should—since the public lands and national forests are owned by all the citizens, and you, as a taxpayer, are paying for the depredations.

The mining laws that permit such misuse of Government land were described by President Truman's Materials Policy Commission last spring as a survivor of the frontier days. They were passed by Congress in 1872, when it was our national policy to give away land to encourage settlement and development of the West. Conservation and watershed management were almost unknown then, and the 1872 laws merely formalized the vigilante rules set up in the lawless mining camps before the Government arrived.

Under those laws, any citizen can file a claim to a 20-acre tract of most public lands in the West. The claim must be based on the discovery of minerals (everything except coal, oil, gas, oil shale, sodium, phosphate, potash, and, in some states, sulfur) "in sufficient quantity to warrant a prudent man in expending his time and money in the development thereof."

UNITED STATES GOVERNMENT AT A DISADVANTAGE

But the claimant doesn't have to prove that he has found minerals or even that he is prudent. He merely has to tack up a location notice, as I did, and record the claim with the county clerk. That gives him the use of the land—not only the minerals underneath, but also the timber and soil on the surface. He is prohibited by law from selling the timber; but he can prevent the United States from selling it. What's more, he can keep anyone else from crossing his territory, and that, again, includes the United States Government, which sometimes has to resort to long, expensive court proceedings to reach its own installations blocked off by mining claims.

A claim is approximately 20.6 acres—1,500 feet by 600 feet. The 1,500 feet is supposed to run along the axis of the mineral vein, giving the man 300 feet of working room on each side. There is no limit to the number of claims one person can file, and an ingenious man has no trouble putting several of them together to follow the winding course of a fertile valley or a trout stream.

To maintain his hold on the claim, a man must simply do $100 worth of so-called development work each year. Since the law considers such materials as sand, building stone, and gravel to be minerals, it is necessary only to run a bulldozed over a few feet of the property or dig a small pit every 12 months. The claim belongs to the original holder and his descendants forever, and he can sell all or part of it at any time.

ACQUIRING "PATENT" TO HIS LAND

If the claim holder wants to get even more complete control of his land, he can buy it outright—or patent it, in the language of the mining laws. To obtain a patent, he must prove only that he has done $500 worth of development work, and he must have the claim surveyed, which costs roughly another $500. Then, after he demonstrates the presence of minerals on his land (gravel might do) the United States Department of the Interior must sell him the tract for $2.50 an acre if the minerals are on the surface, or $5 an acre if they're underground.

Once the claim is patented, the owner can do anything he wants with it. Some people have subdivided the land for homes at a great profit, or built resort hotels. It is not unusual for a miner to spend the necessary $1,000 on his 20 acres, patent the tract for $50 and then immediately sell the timber to waiting dealers for $30,000. Fewer than 15 percent of all patented claims have been mined or are actually used for mining today.

Besides the basic weaknesses which make a farce of the law, it contains loopholes which make it almost impossible to administer.

For example, claims must be filed in county courthouses rather than with the Federal Government. There are about 350 county courthouses in national-forest territory alone and Federal authorities can't even begin to keep an accurate check on how much land they still control and what has slipped away.

If the Government protests a claim or a patent on grounds that the land contains insufficient minerals, the burden of proof rests on the Federal authorities. Proof is hard to get, since pumice, sand, and gravel can be found almost anywhere—and if the Government does have proof, the legal costs of a single case run as high as $1,000.

With thousands of new claims every year and nearly a million existing claims suspected of being invalid, the protests could cost well over a billion dollars.

But even that's not the final straw. According to the law, after a claim has been declared invalid, the holder can file a new claim, and force the Government to kick him out all over again.

A man named Avery C. Moore plastered mining claims on both sides of the scenic Sonora Pass Highway near Yosemite National Park in California, and then sold the claims as real-estate sites for summer homes. To one woman, Mrs. Theresa Furlong, of Modesto, Calif., he wrote in a sales letter, "The price is $1,000, terms if preferred. The acreage is well-timbered and is quite accessible to community facilities, while affording the degree of seclusion so important for those who desire to escape from city heat, noise and high tempo."

Moore said he was mining for building stone, but in 1950 a Government examiner ruled against him, accepting the testimony of expert witnesses that "establishment of a quarry would not be economically feasible because there is no market for stone in the vicinity," and that "tests show that the rock on these claims weathers and decomposes too rapidly." Nevertheless, no sooner is Moore thrown off a claim by the Government than he refiles on practically the same area. He has filed on two canceled claims no less than a dozen times, and his real-estate venture is still going strong.

Another case currently being protested by the Government is in the scenic Kaibab National Forest at a main approach to the Grand Canyon National Park in Arizona, where two principal highways intersect. Nearly a million tourists pass the junction every year, and the triangle of land formed by the intersection is one of the most valuable tracts in the neighborhood, estimated by local realtors to be worth $50,000.

The United States Forest Service turned down rental offers from many filling-station operators because it did not want to compete with privately owned filling stations in the town of Williams, 2 miles away.

Then a group headed by Phillip F. Kenney slapped a mining claim on the valuable triangle. Kenney said he was mining for cinders. The Government filed a protest against Kenney's estate (he died a few months ago and his relatives are pushing the claim). At the hearing in Phoenix last December, a Government geologist testified that volcanic cinders like those on the Kenney claim are found all over the Williams area and that the claim could not possibly be suitable for a commercial operation. Then it was testified that Kenney and an oil company had discussed the possibility of opening a filling station on the triangle.

In both the Moore and the Kenney cases, the miners lived up to the letter of the law, but the Government contended that there wasn't enough mineral present to "warrant a prudent man in expending his time and money in the development thereof." When there is sufficient mineral present—whether it is worked or not—the Government doesn't have a chance.

But what happens when a claim—like mine—can affect thousands of people? Here, too, the answer generally is discouraging.

In Colorado, Forest Ranger W. S. Beckley showed me the Mammoth Basin area which was burned over by a great forest fire and which the Forest Service (helped by the Colorado Mountain Club) now is trying to replant with trees. If the trees are not replanted, the topsoil will erode into Denver's water supply (several inches already have washed away), silting up and possibly destroying one or more of the city's reservoirs. But Beckley and the Colorado Mountain Club are temporarily stymied: more than 400 acres of the basin are clogged up with unworked mining claims.

CITY'S WATER SUPPLY WAS ENDANGERED

In Utah, a man named Wayne E. Watrous obtained some old mining claims along Big Cottonwood Canyon, which is the largest single source of water for Salt Lake City. The Government contends that Watrous could sell homesites

on his claims, and that raw sewage from the new homes would go directly into the city's water supply. Thousands of Utah citizens would have to face disease or foot a big bill for purification.

An even more crucial situation was disclosed by a 1952 Government report which said that claims have been filed on approximately 50,000 acres in the Rogue River National Forest in Oregon, where "assay reports reveal no valuable minerals in commercial quantity." The report warned: "During World War II, the area now covered by the claims produced as much as 88 million feet of timber annually, a material contribution to the war effort at that time. In the event of another similar emergency, the timber cut would be negligible with the lands in their present status."

Today the emergency has arrived. The Government needs the Rogue River timber (worth $30 million) for the construction of Army camps, but it can't get it. And, since the law forbids anyone to cross a claim without permission of the miner, the Government can't even go after $40 million worth of timber on unencumbered Federal property behind the claims.

POOL-HALL MINERS IN SORDID RACKETS

Such situations have spawned a host of sordid rackets. When word leaks out that the Government is going to cut the timber in a certain area, the local pool-hall miners, as they are called, rush out and post mining claims on all the approaches. Then they hold up the lumbering contractor for a $500 to $1,000 fee for right-of-way privileges. In the long run, the cost is borne by the Government—and that means you.

The American people are victimized even in the vital uranium field. Two years ago, A. B. Stewart, a large legitimate mining operator, began looking for uranium in the Pinos Altos mining district of Grant County, N. Mex. When his activity became known, the pool-hall miners turned out in force and soon nearly every square foot of the area was plastered with mining claims. Then, according to a Bureau of Land Management bulletin, "Stewart had to buy out a considerable number in order to carry out his expanded operations." The result: more expensive uranium.

As Stewart's experience indicates, legitimate mining interests are hard hit by the depredations of the opportunists, and time after time they have to pay heavily to get rid of them. The legitimate miners have used the mining laws with careful regard for the public interest, and neither the Forest Service nor the Bureau of Land Management can recall a single serious instance of abuse on their part. In Colorado, the big Colorado Fuel & Iron Corp., will immediately relinquish a claim, if, after drilling, it does not find minerals in commercial quantities. The New Jersey Zinc Co. won't even register a claim until it has made explorations and knows it has found something.

One mining executive told me, "A legitimate mining outfit will never tie up Government land it doesn't intend to use. But lately we have been forced to register some claims far in advance—just to protect ourselves from the pool-hall miners."

The mining industry thinks the problem could be solved by stricter enforcement of the law. In addition, some mining-company executives to whom I spoke suggested putting teeth into the present legislation by allowing the Bureau of Land Management to institute criminal proceedings against violators; by limiting the amount of time that a claim can lie dormant; by prohibiting the refiling of a claim once it has been ruled invalid; and by making it easier for the Government to get a right of way across a mining claim.

Another solution has been proposed by Representative Ken Regan, of Texas. Regan has introduced a bill to eliminate the discovery of sand, stone, gravel, pumice, pumicite, and cinders as a basis for filing a mining claim. The bill has a good chance of passage during this session of Congress.

A third solution is a bill introduced last year by Senator Clinton P. Anderson, of New Mexico and Representative Harold D. Cooley, of North Carolina. The Anderson-Cooley bill provides that all existing claims be forfeited if the owners do not apply for patent within 5 years; and it calls for all mining claims to be recorded with the nearest United States district land office, as well as with the county clerk. But most important, the bill would separate the mineral from the surface rights. A man filing a mining claim would be entitled to use only as much of the surface as he needs for mining operations, space for mine buildings, timber for shoring up tunnels, and so on. The rest of the surface, including the standing timber, would remain in the possession of the United States.

Still another solution received at least the partial approval of the President's Commission last June. It would eliminate mining claims altogether; instead, the Government would lease public lands for mining operations, as is done on more than 30 million acres of eastern Federal lands, and in the case of all coal, oil, potash, and other so-called soft minerals found on public lands.

STRONG OPPOSITION TO BOTH SOLUTIONS

Both the Anderson-Cooley bill and proposals to lease the western public lands are vigorously opposed by almost the entire hard-mining industry of the West, and there seems little likelihood that either solution will become law soon.

But the various suggestions indicate mounting concern over the problem. What the final solution will be is any man's guess, for both Congress and the new Eisenhower administration vary in shade from ardent Federal conservationists to equally ardent State righters, who would like to turn the public lands over to the States. (A middle-ground bill, letting the Federal Government keep the land, but giving its minerals to the States, has been introduced by Senator Lester C. Hunt, Wyoming (Democrat).) There's only one certainty: the present system must be changed.

You have only to think of my mining claim up there in the Loveland Pass, blocking off a national highway. You have only to think of how thousands of such claims could cripple America—in peace and in war.

[From Time, June 15, 1953]

THE WONDER METALS—KEY TO AIR SUPREMACY

The cold war has created a new kind of industrial battlefield. Obscure and little known, it lies behind closed laboratory doors. There, researchers for industry and Government are tackling the problem of developing and perfecting wonder metals—those metals capable of meeting the unparalleled strains and stresses of the jet and atomic age. Aircraft builders have already laid down this axiom: The Nation which first masters the use of wonder metals will rule the air.

Jet engines often reach temperatures of 3,700° F. at the core of their blast, hot enough to burn ordinary steel like paper. The planes themselves are approaching speeds at which aluminum aircraft skins would lose their strength, then melt. Nor is heat the only problem. Building of the first atomic reactors disclosed the fact that most metals absorb or eat up the atomic neutrons needed to provide the fission and motive power.

The great metals search explores a field that is relatively new. Some of the new metals were little more than laboratory curiosities until the air age created new needs. Gradually these curiosities were found to have enormous possibilities.

Two of the best known wonder metals, aluminum and magnesium, are now commonplace, although a few decades ago they were prohibitively high priced. Aluminum and its alloys are still the basic materials of all aircraft. But magnesium, which is one-third lighter, is encroaching on aluminum's domain (Douglas' 1,238-mile-per-hour Skyrocket has a magnesium-sheet fuselage). In the field of atomic power, the most important metal, next to uranium, is zirconium. Reason: It is one of the few metals yet found which will not absorb atomic neutrons. But it is a frightening metal to process; in powder form it is so unstable that it will ignite from the motion of just being transferred from one dish to another. Its ores are more plentiful than tin, but the metal itself is still scarce.

Until recently, one of the scarcest and hardest sought metals was columbium. Although not extraordinarily tough in itself, it mixes with steel, nickel, and other metals to make alloys that can withstand the tremendous jet heat. The United States must depend on Africa, however, for 95 percent of its limited supply. Accordingly, a big hunt was started for substitutes and yielded the most promising wonder metal of all—titanium.

Titanium, the world's ninth most common element, is almost everywhere in the earth in minute quantities. It has been used for years in a powdered, oxide form to make paints whiter and make them cover better. But titanium combines so readily with any other element that for years it was considered impossible to refine as a pure metal (scientists call it the streetwalker, because it will pick up anything).

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In 1946, the Government's Bureau of Mines announced it had found the first practical way to refine it into commercially pure form. The Government subsidized experimental pilot plants to process small batches of titanium into sheets, rods, etc., and commercial production of titanium was started by du Pont and Titanium Metals Corp. But the Air Force wanted titanium desperately not only in its pure state but as an ideal substitute for columbium as a hardening agent in alloys. It pressed for a huge program to boost production to 22,000 tons by 1955 (current production: 3,400 tons a year). A long fight ensued. Some defense officials argued that, with sheet titanium costing as much as $20 a pound, such a program, with a guaranty to buy all the titanium produced, might cost the Government $500 million a year. Air Force men argued back that all titanium is being sold as fast as it is produced, regardless of price.

Defense Secretary Charles Wilson has now bought the Air Force argument. He has approved a new $10 million loan for Titanium Metals Corp. to expand its pilot plant, and a $26 million loan for Chicago's Crane Co. to build the biggest titanium plant yet planned, near Nashville.

Other battles are fast being won. Originally, titanium proved incredibly difficult to machine and work. But dozens of steel companies have been working with the metal, and have found ways around the difficulties. Titanium, only half as heavy as stainless steel and four times as strong as most aluminum alloys, is now replacing both steel and aluminum in aircraft for skins, parts, and struts.

The promising field of powder metallurgy is rapidly enlarging its horizons; jet rotor blades of exceptional hardness and heat resistance are now being made out of powdered titanium carbide and a metallic binder fused under tremendous heat and pressure. The big unsolved problem is cost, an incredible $30,000 per ton versus $780 to $1,020 for stainless steel. But as Wilson's program expands production, nobody doubts that United States ingenuity and research will whittle down the cost, just as magnesium's cost has been whittled from $5 a pound in 1915 to 27 cents a pound in 1953. In that prospect glows the promise of a great new United States industry.

[From the World Today, July 1953]

Raw Materials: Scarcity or Plenty?

Immediately after the Second World War the raw material producers feared the danger of overproduction, and today uncertainties as to market prospects are beginning to reappear. The intervening years, however, have witnessed the invasion of Korea in July 1950 and the ensuing commodity boom, which reached a peak during 1951. Acute scarcity of raw materials is not at the moment a problem, with the result that all but two of the allocation committees of the International Materials Conference have been wound up. But the question remains relevant whether sufficient is being done today to ensure that in the more distant future the supply of raw materials will keep pace with the expansion in manufacturing. This new Malthus ghost, which was first seen during the war and which reappeared with the Korean armaments boom, is discussed in a recently published Chatman House Information Paper on the world production of raw materials.[1] In view of the possibility in the future of continuous pressure on world raw material resources, it may be helpful to summarize some salient facts given in the Information Paper on postwar developments both in the production of raw materials and in the use that has been made of them.

NEW USES

The discovery of new uses for the world's natural resources is characteristic of modern times. For instance, an increasing variety of uses is being found for both natural and synthetic rubber, although early two-thirds of all the rubber produced still goes into tires and inner tubes. Apart from the various traditional uses for zinc, this metal has been increasingly employed for alloy diecastings, particularly in the motor and general engineering industries. Lead also has important new uses, such as the sheathing of electric cables. The growing impor-

[1] World Production of Raw Materials [Information Papers No. 18]. (London: Royal Institute of International Affairs, viii, 104 pp. 7s, 6d.) The book includes 48 statistical tables showing production of raw materials.

tance of iron and steel, both in war and peace, need not be emphasized; for the steel industry a great variety of alloying elements such as nickel, chrome, manganese, molybdenum, tungsten, and vanadium are now more essential than ever before. Another important developmet, not only in steel production but also in the case of other metals such as copper, lead, and tin, has been the striking increase in the use of secondary metal or scrap.

The extent to which aluminum has lately risen in importance is phenomenal; in 1936 world production was about 360,000 tons, whereas in 1950 it was 1½ million tons. The world production of bauxite, from which aluminum is derived, increased during the same period from 2¾ million to 7½ million tons, reaching about 10 million tons in 1951. In its pure form aluminum is used mainly for pots and pans, etc., but it is as an alloy with copper, zinc, silicon, and magnesium that this lightest of metals after magnesium has gained its predominant position, in particular in the aircraft industry. A development worth mentioning is the exploitation and use of natural gas, which has increased by leaps and bounds. One of the vital needs of today is an ample reserve of oil; not only has petroleum assumed an ever-growing importance as a source of energy, but together with coal it is one of the two basic natural raw materials from which the new synthetic materials are derived. The advent of synthetic materials, which have been developed at such a very rapid rate in the last 2 or 3 decades, may indeed herald the beginning of a new industrial revolution. The many different existing types may be roughly divided into plastics, synthetic rubber, synthetic fibers, dyestuffs, and detergents. The use of plastics in many forms is daily growing wider. The level of production by the United States of synthetic rubber is a question of outstanding importance, not only to the actual natural rubber producers, but also, owing to the dollar position, to the sterling area as a whole. The striking expansion in the output of artificial fibers, such as rayon, nylon, orlon, and terylene, is now a major factor in the textile industries, and the implications in the growing use of detergents was emphasized by Sir Geoffrey Heyworth in his recent speech before the annual meeting of Unilever.[2] He pointed out their influence, not only on the world market for oils and fats, but also on the world supply of glycerine, a byproduct of soapmaking.

TRENDS IN POSTWAR PRODUCTION

Raw material production responded to wartime demand and increased rapidly, in some cases phenomenally, reaching a peak sometime during the earlier war years—the peak year for metals, for instance, was 1943. Thereafter, world production fell slightly until it began to drop sharply at the end of the war, reaching a low point in 1946 when output had generally sunk to between one-half and three-quarters of the prewar level. After that production once more recovered, increasing steeply in 1951. But even so, in that year only nine commodities (i. e., petroleum, iron ore, manganese, chrome, antimony, pyrites, sulfur, and both synthetic and natural rubber) recorded a larger output than the peak reached during the war. Since the war, as indeed in any other period, the volume of production tended to be influenced by commodity prices, which in turn were determined by demand rather than supply. This generalization did not, of course, apply to all commodities individually, but broadly speaking it held true to a surprising degree. It meant that the United States, the major consumer, played a determining role in raw material production. Moreover, the fluctuations in commercial demand tended to be reinforced by the United States Government's stockpiling program.

In September 1946, commodity prices began to rise. During 1949, a sharp drop in prices occurred which was followed by a slow upward movement. Then came the invasion of Korea and the scramble for commodities, and prices reached a fantastic peak, generally in the first quarter of 1951. The inevitable reaction followed, a protracted decline in prices, but at that time not, on the whole, a sharp one. Metals and minerals were the most directly influenced by these swings in commodity prices (their output could be controlled fairly easily); agricultural raw materials were not affected to the same extent and generally reached their peak production in 1949 or 1950. Synthetic materials recorded their highest output in 1950 or 1951; synthetic rubber was an exception, with an output controlled by the United States Government and governed by political considerations.

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[2] The Times, June 11, 1953.

Apart from price movements, there were other important factors influencing the output of raw materials, particularly during the immediate postwar years; the setback in 1945–46 was a natural reaction to the war effort when normal maintenance and development had to be neglected. It was a time when raw material requirements were temporarily reduced because industry had to be converted from a wartime to a peacetime footing. "Slump psychology" played an important part, but almost equally significant were the rising costs due to inflation and the lack of the capital equipment which was needed, above all, for the provision of adequate transport facilities in continents such as Africa or Australia.

GEOGRAPHICAL DISTRIBUTION

The location of raw material sources has been of special significance since the war, not only for strategic reasons, but also because of the "dollar gap." The absence of convertibility and the consequent division of the world into separate currency areas has meant that the soft currency countries have tried to become more self-sufficient and that a distinction between "dollar" and "sterling" commodities has assumed special significance. The dollar area, including Canada, is a net exporter of aluminum, molybdenum nickel, copper (electrolytically refined), zinc, coal, crude sulfur, synthetic rubber, soft wood, cotton, woodpulp, and petroleum. The "sterling commodities" are tin, rubber, jute, wool, rayon, hard hemp, manganese, and chrome. Of these, the United States is already a large importer of tin, rubber, wool, and jute manufactures, but not of raw jute. The currency situation has other facets. For instance, refining capacity, especially in the sterling area, has at times restricted the supply of raw materials available for industries in the sterling countries. In this connection, mention must be made of the efforts of recent years to increase the refining capacity in proximity to the mining areas. A good example is the erection of the new electrolytic refineries in the copper belt of Northern Rhodesia. But oil refineries, for instance, have lately tended to move in the opposite direction, from the producing to the consuming area, an illustration of the important effect of unsettled political conditions and of strategic and currency considerations. The enormous increase in the production of oil in the Middle East is so well known as to need no special comment.

The Information Paper contains an interesting table which shows estimates of the proportional distribution of the principal raw materials in 1950 by area of production. The area groupings used include not only the sterling and dollar areas, and the Commonwealth, but also the NATO countries, the U. S. S. R., and the Soviet bloc. Although the available information is known to be scanty, a few broad conclusions may be drawn from the point of view of strategy. It is clear that the Communist bloc possesses a smaller share of the world's raw materials than the free world. The principal commodities of which the Communist countries are known to have a preponderance are flax, true hemp, and possibly silk, none of them strategic materials. However, the availability of a given material must be related to civilian consumption so as to get an idea of prospective war supplies.

INTERNATIONAL COOPERATION

Temporary maladjustments in raw material supplies and the consequent instability of commodity prices can seriously hinder investment in primary production, quite apart from their other ill effects. This problem is, of course, not new, and in fact various attempts to exercise some sort of international control were made as long ago as the time of the great depression. Two well-known examples were the prewar rubber and tin restriction schemes. The first real step toward international cooperation, however, came after the war. International study groups were established under the United Nations for rubber, tin, and wool, and the International Cotton Advisory Committee was formed. When the study groups were negotiated, account was taken of the unratified draft charter of the International Trade Organization (the Havana Charter), which specified that all countries substantially interested should be represented in any given commodity control scheme and that the nations which are mainly importers of the commodity should together have equal voting power with the countries which are mainly exporters. Yet postwar experiments in international cooperation for the stabilization of commodity markets have by and large proved a failure. The international study groups have up to the present proved ineffective in so far as suggested measures to deal with prospective surpluses or

shortages have never actually been adopted for lack of agreement between producers and consumers. The FAO had two failures with the abortive "buffer stock" scheme immediately after the war, and the 1949 proposal to set up an international commodity clearing house. Another failure was the international scheme for tin which was attempted both in 1949 and 1950.

The International Wheat Agreement was virtually the only commodity scheme to become effective after the war. It amounted to a 4-year multilateral contract. But even here disagreements in negotiating its prolongation after July 1953 have culminated in its probable future implementation without the participation of Great Britain, the largest single consumer. Though regional cooperation as such was not the subject of the Information Paper, mention is made of the Commonwealth wool disposal scheme as a successful venture. This was controlled entirely by Britain, Australia, New Zealand, and South Africa, although other countries were represented on the consultative committee. The scheme allowed accumulated wartime stocks to be liquidated within 5 years. This task, however, was greatly facilitated by an almost insatiable world demand for wool.

The shortage of raw materials caused by the rearmament drive was needed to stir the free world into initiating a vital experiment in international cooperation, the International Materials Conference. Under the IMC, which was launched in Washington in January 1951, a central group and a number of commodity committees were set up to consider raw materials in short supply. International allocation schemes were introduced which were, in fact, modelled on the procedure evolved by the Coal Division of the Economic Commission for Europe which had allocated European coal since 1946. It is worth noting that the success of IMC depended on the willingness of countries to cooperate as there was no formal authority, no written constitution, but in general only a reliance on the working of normal export and import control. Twenty-eight countries joined the IMC and there were 7 commodity committees: for copper, lead, and zinc; sulphur; cotton and cotton linters; wool; pulp and paper; tungsten and molybdenum; manganese, nickel, and cobalt. Only the 2 last-named committees remain in existence; with the disappearance of acute shortage, 3 were wound up in September 1952 and another 2 in March 1953; only nickel and molybdenum are still being allocated.

SCARCITY OR PLENTY?

The Information Paper makes the point that production of raw materials in 1950 was only some 10 percent larger than in the 5 years immediately preceding the war, whereas manufacturing had increased by about 40 percent. Although the period selected was not altogether normal, the figures remain suggestive. Is there, the paper asks, a likelihood that world manufacturing may in the long run outstrip the supply of raw materials? It is pointed out that history cannot supply an answer because large-scale industrialization dates back only some 150 years. In the 19th century the discovery of the steam-engine not only helped the development of manufacturing but it also opened up new continents, making available new resources. In the present century, industrial expansion is based not only on technological advance but also on the advantages of large-scale production and on improvements in organization and management. What is more, there has been no innovation comparable with the steam-engine to provide new cheap transport facilities for the underdeveloped countries, although this may still come when atomic energy is harnessed for industrial use.

Industrialization is moving apace in many underdeveloped countries, as for instance in Latin America. The United States is expected to continue expanding at the compound rate of 3 percent per annum. This would mean, according to an estimate presented by the United States President's Materials Policy Commission (the Paley Report),[3] which was concerned with materials supplies for the long-term economic expansion of the United States, that by 1975 the United States would be using 60 percent more raw materials than in 1950. But that country is already the world's largest consumer of practically all raw materials—a prewar trend which was translated into fact after the war when Great Britain was overtaken as the largest consumer of one commodity after another. Broadly speaking, the United States already consumes as much as one-third or one-half of any particular raw material. It is true that only 11 percent of the United States' land surface has so far been adequately surveyed, so that unsuspected

[3] Washington, U. S. Government Printing Office, 1952.

mineral reserves may well be concealed in the thin mantle of young rock which covers half the country. But on the other hand, some of her mineral deposits, for instance the high-grade iron ore of the Mesabi Range, are nearing exhaustion and the probability is that any further increase in American demand for basic material will largely have to be met by a greater dependence on imports. If world production expands sufficiently to meet the additional demand, this trend might provide a long-term solution to the dollar problem. But the industrial capacity in other countries is also expanding, sometimes at an even higher annual rate than that of the United States.

There is one postwar trend which may tend to reduce the future demand for raw materials at any given stage of industrial activity. It is the fact that, prompted by the threatened raw materials shortage of 1950–51, industry has learned to economize in the use of scarce materials. What is more important, manufacturers are adopting the more economic methods as part of their normal production process. There have been roughly three lines of attack: the use of substitute materials; the saving of scrap and swarf; lastly, but more fundamental, a statistical approach to stock control. The latter involves the cutting-out of waste through the adaptation of standard specifications and by adjusting blueprints so that a maximum number of items could be obtained from a given sheet of metal. The Information Paper points out the considerable scope that exists in this field and the profound effect economy in the use of materials may have in the future. It may create serious problems for primary producers in the immediate future, if the world returns to a more peaceful setting. But it does not necessarily mean that the world demand for raw materials would decline if the rate of expansion in industrial output is sufficiently high. In any case, future worldwide expansion in peacetime requirements for consumer goods would have to be anticipated by large-scale investment in primary production.

DEVELOPMENT PROJECTS

In agricultural production there has been an endeavor in recent years to obtain a larger output from a given area of cultivated land by means of improved methods. Cotton production, for example, has been increased in East Africa, Nigeria, India, and Pakistan. But serious efforts to develop natural resources took place only after the outbreak of hostilities in Korea in July 1950, and were concentrated on the production of strategic material. The preponderant part was naturally played by American capital. Inside the United States, newly discovered deposits of copper, lead, zinc, and tungsten are now being worked in Alaska, new deposits of manganese in Arkansas, of tungsten in Oregon, and a new large elemental sulfur dome was discovered in Louisiana at a time when concern was felt over the exhaustion of known sulfur reserves. The production from known deposits of minerals such as uranium, zinc, magnesium, and petroleum was also intensified. Foreign investment of American capital is still relatively small, except in Canada and, in the case of oil development, also in Venezuela and the Middle East.

In the Commonwealth the lead has been taken by Canada with her wealth of untapped resources and with the American market so near at hand. That country is now believed to be virtually "floating on a sea of oil" and before long it might well become one of the most important petroleum producers of the world. Vast new iron ore deposits have been discovered and are being exploited in Labrador and Quebec. Aluminum production is being expanded and the output of bauxite in British Guiana and Jamaica is being increased to meet the larger Canadian requirements. Canadian nickel production is also being further developed and mines are replacing the surface deposits. There are other Canadian projects, not mentioned in the information paper, such as the development of natural gas in the prairies and uranium in the north.

Other parts of the Commonwealth also have large untapped resources of most raw materials; exceptions are nickel, natural sulfur, and molybdenum. Their development is proceeding, though not at such a rapid rate as in the United States and Canada. Copper and cobalt are being developed in Northern Rhodesia and Uganda. Large-scale zinc and lead mining is to be started in Nigeria and the production of these two metals is to be increased in Australia. Aluminum is to be produced in the Gold Coast from indigenous bauxite. Manganese production is expected to increase in India and South Africa; tungsten in Britain, Nigeria, and Uganda; beryllium in India; iron ore in Sierra Leone and Malaya; chrome in Southern Rhodesia; pyrites for sulfur in Cyprus; and uranium in South Africa. Outside the Commonwealth output is also increas-

ing. To take some examples, iron ore is being developed in French Guinea and elsewhere, manganese in the Belgian Congo and Brazil, nickel in Cuba and New Caledonia.

It is almost impossible to assess precisely the ultimate importance of all these new schemes. Some will doubtless have a considerable effect on future raw materials supplies but many of them were started for reasons of strategy and costs may therefore prove too high for some of them to be maintained in competitive conditions. This is perhaps more particularly true of the United States itself, where most of the high-grade materials have already been won. If, however, the world's population continues to grow at the present rate and if the standard of living in the backward areas is to be raised, the "new Malthus ghost" discussed in the information paper might one day be found to have substance. But adequate expansion of the international schemes for financing long-term developments, and the stabilization of commodity markets through effective international cooperation, would go a long way toward averting any such danger.

[From the New York Times, August 6, 1953]

PRICE OF COPPER DROPS IN LONDON AS 14 YEARS OF CONTROLS ARE ENDED

LONDON, August 5.—The price of copper dropped far below the Government-controlled level as free trading in the commodity was resumed on the London Metal Exchange today after 14 years of Government restrictions.

The Government's selling price yesterday, the last day of controls, was £252 a ton ($705.60).

The closing price today for cash was £215 to £217 10s a ton ($602 to $609).

For delivery in 3 months the closing price was £200 to £210 a ton ($560 to $588).

The trading, which resulted in the sale of 2,250 tons, was marked by relatively little fluctuation in quotations. The low for the day was £199 a ton for 3 months' copper.

In discussing the day's activity the Times of London noted that the Metal Exchange's standard quotations were not directly comparable with those of the Ministry of Materials in force until yesterday.

It said the Ministry of Materials' selling prices were based on a wider range than the wire bars mentioned in the Metal Exchange contracts and they also included delivery charges. At least £2 a ton would have to be added to the Metal Exchange quotations to bring them into line with the former quotations of the Ministry, it declared.

Copper was the last of the nonferrous metals formerly dealt in by the exchange to be removed from the controls the Government placed over them when war broke out in 1939. Tin was returned to the free market in 1949, lead last October and zinc in January of this year.

The Government, which has stocks of copper amounting to about 240,000 tons, plans to sell enough to fill consumers' needs. This is expected to mean the release of 60,000 tons but more may be freed if it is needed for industrial production.

The copper that is not put into this pipeline will be placed in Britain's strategic stockpile.

DROP GREATER THAN EXPECTED

The copper price drop in London was somewhat greater than had been generally expected in New York. The closing London quotation for spot copper, £212½ a ton asked, was equal to about 26.56 cents a pound in United States currency. Freight and handling charges would bring that price to roughly 27.89 cents for copper shipped from an inland warehouse in Britain to Connecticut Valley delivery points in this country, copper traders said.

Domestic copper prices range from 28½ cents a pound, delivered Connecticut Valley—quoted by a large custom smelter—to the 30 cents quoted by the big mine producers. However, most copper recently has been booked on the basis of price prevailing on date of shipment, or average price over a specified period established by negotiation.

[From the Chicago Daily Tribune, August 7, 1953]

COPPER PRICE SLUMP STIRS BRITISH STORM

LONDON, August 6.—Estimates that the British Government faces a loss of 20 to 30 million dollars on its stocks of copper today stirred criticism here against Government controls and interference in the national economy.

For the last 14 years and until yesterday the Government had a monopoly in the copper market. It accumulated stocks totaling 240,000 tons. At the beginning of this week the Government was still charging domestic buyers $705.60 a ton compared with the open market price of $612 a ton. Smart operators yesterday paid only $590 a ton.

OUTPUT TOPS PREWAR LEVEL

The fall in price came with the restoration of a free market in copper and the end of the Government monopoly. One of the main reasons for the price slump is that the current world copper output, totaling about 3 million tons yearly, is 23 percent above prewar level. At the same time there has also been a considerable growth in copper substitutes.

The London Daily Express said the Ministry of Materials, which operated the Government copper control, had mismanaged its buying operations.

"It bought too much," the paper said. "It bought too dear. It hung on too long. It is the old story of foolish trading, so often repeated. The only difference is that this time the loss will fall on the taxpayer."

The paper protested against another "crazy situation" resulting from the Government's control over Britain's bacon supplies.

STORES OVERSTOCKED

The Government last year contracted to buy 90 percent of Denmark's surplus bacon. Now British shops have got more bacon than they can sell, said the Express. "The British storage houses are loaded up with all the bacon they can hold," it asserted. "Furthermore, Britain cannot stop buying Danish bacon. She must take more and more of the stuff, even though she does not want it."

Bacon is rationed in Britain at the rate of 5 ounces a person weekly. The ration is more than the public wants to buy and today the food ministry said the price of bacon would be cut. Sugar will be derationed in September, too, the ministry said.

[AMA Conference Reporter, Finance Conference, November 19 to 21, 1953]

GOVERNMENT AND BUSINESS MUST ACT TO MEET NEED FOR RAW MATERIALS—MASON

Action by both private investors and governments is needed if the free world's rapidly mounting requirements for materials are to be met from lowest cost sources of supply, according to Dr. Edward S. Mason, Dean of the Harvard University Graduate School of Public Administration and member of the President's Materials Policy Commission.

A greatly increased investment abroad of both capital and technical know-how is going to be needed, Dr. Mason said. Traditionally the principal investors in minerals resource development have been large American and western European mining and oil companies.

Private investment of this type, according to Dr. Mason, "is without doubt the most efficient channel of development, and private enterprise carries with it its own technical assistance program." "However, if this channel is to be used efficiently, an important series of obstacles must be removed."

These obstacles to expansion are not technical difficulties of extraction and cultivation, Dr. Mason explained. Reserves of high-grade minerals are abundant in resource countries, and there are large possiblities for expansion of agricultural output. Instead the obstables lie in governmental policies and in investor attitudes toward the risk of foreign operations.

In part, he said, these obstacles can be removed by changes in public policies of the United States and other investing countries. In part, their removal requires action in the resource countries themselves. And in part, there is need for joint action by resources and investing countries.

Although removing obstacles to private foreign investment and providing incentives for it is the most important task, it is not the only one, Dr. Mason emphasized. "For a certain number of minerals, security considerations necessitate Government action in the form of guaranties, loans, and, possibly, direct investment if expansion of output for export is to be accomplished. And if resource countries are to cooperate in an expanding program of materials development, they must be given technical and capital assistance in the promotion of their general development programs."

Dr. Mason warned against misinterpretation of "perhaps the most widely quoted finding" in the Commission's report, that the United States within the last decade has become dependent on foreign sources of raw material supply. That fact does not mean, he emphasized, that this country is becoming a "have not" nation or that we must import regardless of the prices of imported raw materials. "In fact," he pointed out, "there are available domestic substitutes for most imported materials. Consequently our dependence on foreign sources of supply will increase only if materials are forthcoming from these sources on reasonable terms."

However, Dr. Mason reminded the financial executives attending the conference, the United States interest in an expanding output and export of materials from resource countries is by no means limited to a consideration of our own requirements. Other highly industrialized raw-material-importing nations are much more vulnerable than the United States to rising costs of imported foodstuffs and materials. The productivity and well-being of such nations as the western European countries and Japan are directly affected by the terms on which they can exchange their manufactured exports for imports of foodstuffs and raw materials, and their productivity and general economic well-being are vital factors in their military contributions to our mutual security program. "This is a consideration our foreign policy must definitely take into account," he declared.

RESOURCES: FROM ABUNDANCE TO SCARCITY BY 1975?

A Round Table Discussion

FELIX E. WORMSER, *Chairman*

EUGENE AYRES
PHILIP H. COOMBS
ARNOLD C. HARBERGER
ROBERT P. KOENIG
SAMUEL G. LASKY
EDWARD S. MASON
W. S. WOYTINSKY
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The President's Materials Policy Commission

William S. Paley, Chairman

George R. Brown
Arthur H. Bunker
Eric Hodgins
Edward S. Mason

Reports of the Commission

Volume I —Foundations for Growth and Security
Volume II —The Outlook for Key Commodities
Volume III—The Outlook for Energy Sources
Volume IV—The Promise of Technology
Volume V —Selected Reports to the Commission

Foreword

THE PRESIDENT'S Materials Policy Commission was created by President Truman in January, 1951, to survey the current position and future adequacy of the materials resources of the United States. Under this charter, one of the most difficult tasks the Commission undertook was to estimate the uses and sources of materials as of 1975. It finds in its own words that "in area after area the same pattern seems discernible: soaring demands, shrinking resources, the consequent pressure toward rising real costs, the risk of wartime shortages, the ultimate threat of an arrest or decline in the standard of living we cherish and hope to help others to attain."

This viewpoint coincides with the finding of an earlier Conference Board Report. "As these natural resources diminish," we stated in April, 1951, "they, in turn, intensify our dependence both upon foreign sources of supply and upon technological innovations designed to offset our own have-less position. Our interest in private investment abroad, as well as in the political and economic developments in foreign countries to which we look for such supplies, is thereby intensified." ("Key Materials: Current Supply and Outlook," *Studies in Business Economics*, No. 28.)

The Commission after its extensive examination submitted an impressive body of recommendations. These range from the obvious need for more and better statistics to such highly controversial proposals as government aid, and in some cases government participation, in the development of resources, as well as the

establishment of buffer stocks for some commodities, to minimize market fluctuations.

The complete report is truly monumental and its five volumes have already become a standard reference source.

THE CONFERENCE BOARD in recognition of its international importance accordingly arranged for a panel composed of experts from the Commission and its staff and outside independent authorities to discuss its findings and recommendations. We are indebted to William S. Paley, Chairman of the Commission, for his understanding cooperation throughout this undertaking and to all participants for their generous permission to publish their remarks.

JOHN S. SINCLAIR

December, 1952

RESOURCES: FROM ABUNDANCE TO SCARCITY BY 1975?

The Cornerstone—The Model for 1975

1. Arnold C. Harberger[1]
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MANY people tend to view the projection of economic magnitudes as but a modern counterpart of the time-worn practices of seers and soothsayers, witch doctors and medicine men, astrologers and fortune tellers.

At its inconceivable worst, the science of projections might really live up to this imputed ancestry and try to explain the future course of materials demand in terms of the phases of the moon or the juxtapositions of Saturn, Mars and Venus. In practice, of course, it never gets that bad; but there are some all too typical techniques of projection that are hardly much better.

Take the common practice of trend projection, for example. If someone were to say that because copper demand in the past had grown at 1.8% per year, it was likely to continue to do so in the future, how far would our knowledge or understanding have advanced? I would blame nobody for viewing such a statement with the utmost skepticism. It obviously isn't the passing of a year which causes the demand for copper to grow. To make the statement at all relevant, we have to find out what actually causes the demand to change and to ascertain whether it is reasonable for these really causal factors to grow in the future at the same rate and to operate with the same intensity as in the past.

OTHER FACTORS THAN POPULATION AND GNP

It is a step in the right direction—but hardly a very big one—to relate the past history of copper demand to changes in such major economic magnitudes as population and gross national product. These are, it is true, important causal factors, but they are nowhere near the only ones; and the presence of other important factors can hurt us in two ways: Not only may it be necessary to take them into

[1]Formerly on staff of the Commission.

account in order to get an adequate picture of what is likely in the future, but failure to consider them may also grossly distort our picture of the past.

Two examples will suffice to show the pitfalls here: Over the past generation, per capita tin consumption actually fell while gross national product doubled. Can we infer that future growth in GNP will be accompanied by further drops in tin consumption? No! We must recognize that the past relation is misleading as a guide to the future, since the fall in per capita tin consumption came in spite of—and not because of—the increase in GNP. What really caused the fall was the development of new materials and techniques—electrolytic plating, lead and aluminum foils, and relatively tin-free solders. The question for the future is whether further new developments will result in similarly important savings of tin in the next generation.

My other example is of the opposite type. Since before the war, per capita aluminum consumption has increased about three times as fast as gross national product. The main cause of this extraordinary growth was not the increase in GNP, but the development of a large number of new uses and the especially rapid expansion of some old ones. It is obvious that the tendency for aluminum demand to grow more rapidly than GNP cannot be fundamental for the very long run. No matter how big a head start the tortoise has, the hare must ultimately catch up if he always moves three times as fast—and a gross national product consisting entirely of aluminum is an obvious absurdity!

This clearly does not mean that demand for aluminum, or any other metal, might not grow more rapidly than GNP for the next twenty-five or fifty or seventy-five years. But it does mean that such extra rapid growth as does occur will be due to the development of specific new uses or to extra rapid growth in specific old uses, and not to any fundamental tendency for every rise in GNP to *cause* a more than proportionate rise in aluminum demand.

THE END USE OF THE PRODUCTS

These examples should not only suffice to show why I reject the use of simple past relations between materials demand, population and GNP; they should also indicate the rationale for the procedure that we actually did use. The keystone of our procedure is that materials are used to make things; and our overriding precept in making projections has been: "Don't guess at how much material is going to be used until you are ready to say where the stuff is going."

The procedure itself should be familiar to all of you who have read the Report. It asks, first of all, what end products is the material—say it is copper—now being used to make. Then it asks

how the demand for these end products is likely to change in the future; and, finally, it projects the demand for copper in each use to grow in proportion to the demand for the end products in that use, unless technological changes are clearly foreseeable.

You may very well retort that I have got myself out of the frying pan of projecting materials demands and into the fire of projecting demands for end products. As a matter of fact, end products are not always easy to project, but I take refuge in my conviction that, without projecting them, you get nowhere at all. If, in fact, one's anticipations of the future demand for important end products are hazy and hard to quantify, it is only by the sheerest sophistry that he can pretend that his anticipations of the future demand for the materials that make these products are sharp and easy to quantify.

"SOME TOLERABLY SHARP GUESSES"

Fortunately we can arrive at some tolerably sharp guesses of the future demand for many of the end products that are the most important users of our materials—automobiles, houses, home appliances, to name a few—and where we aren't so lucky we just have to say so.

No careful reader can conclude from our document that aircraft production in the years around 1975 is rigidly bound to be between four and one-half and five and one-half times its 1950 level. When we project aircraft production at five times its 1950 figure, we make it abundantly clear that all we really know is that it is likely to grow rapidly—much more rapidly than our output of goods and services generally.

On the other hand, it should be evident to any prudent reader of our discussion of automobile demand that it takes pretty implausible assumptions to get a figure of less than 6 million or more than 8 million for average annual demand for new cars around 1975.

For to get a figure of more than 8 million, we must postulate that the average 1975 household, though only a third richer than the average 1950 household, will own almost one and one-half cars; to get a figure of less than 6 million we must postulate that in 1975 we will have less cars per household than we have today.

"NO INTELLECTUAL WITCHCRAFT"

This should make clear my main refutation of the charge of intellectual witchcraft. The procedure by which our projections were obtained is not a mumbo-jumbo process full of hidden assumptions and magical gadgets. It is a straightforward attempt to distinguish the plausible from the implausible on underlying assumptions which are quite explicit. In making the projections, we do not ask you to have blind faith in us; rather, we ask you to follow us, step by step,

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through the process. We invite you at each step to make your own judgments of the range within which particular assertions are valid and to see whether, in the end, your answer turns out very different from ours.

In short, we want to impart not a set of specific numbers to be accepted without question, but a sort of feel for the fact that there are limits to what is plausible, even for a time as far away as 1975. Once the existence of such limits is recognized, we try to impart a similar feel for where they lie; and, finally, we hope that the actual numbers we project will be acceptable as broadly representative of this range of plausible possibilities.

Skeptics may still complain, however; they may say, in effect: "Sure, we follow you along and agree that your figures are plausible, *given your assumptions*, but what about the assumptions? If you assume away new products and new technologies, you are all right. But have we any guarantee that the whole show won't be wrecked by the same inventive genius that has constantly changed the shape and structure of our economy in the past?"

NEW PRODUCTS MIGHT EASE SUPPLY NEEDS

To answer these queries, we must examine the frame of reference in which our work was carried on. In an immediate sense, we looked into the long-term prospects for materials because the President asked us to. But in a much broader sense we were doing, in a particular area, a job which any sensible society must do in a whole host of different areas.

A society just isn't very bright if it lives from hand to mouth or day to day. Potential enemies must be found out, potential weaknesses buttressed, potential strengths developed. And to do these things you just have to look ahead.

When a society does a job of looking ahead, it cannot take refuge in the hope that problems which today seem real might tomorrow just *somehow* be averted. The Russians may never fight us, but we still must be prepared. In the materials field, new products substituting for the old may eliminate the pressing demands on scarce materials that we foresee, and so may new techniques in adapting abundant materials to fulfill needs which now can only be met by scarce ones.

CANNOT COUNT ON NEW DEVELOPMENTS

But these are possibilities which we simply can't count on. The new products of the next generation may even add to the demand for already scarce materials, and new techniques may create scarcities where none existed before. Not only can't we count on new developments to solve our problems for us; we can't even count on their not

making our problems worse. The only wise course is to take into account now the things we can foresee on the basis of what we now know and to adjust our sights, as any sensible investor does, when new developments appear on the scene. The fact that some unanticipated developments are bound to appear between now and 1975 probably dooms our projections to fail as predictions, but they still stand as wise guides to policy as of today.

A BUILT-IN ALARM SYSTEM

This brings me to my final point about our method of projection. By being explicit *about how* much of *what* is going to be used *where*, this method has a sort of built-in alarm system. Anybody who follows the basic data from year to year will be able to know immediately when our assumptions about products and techniques go wrong, and when they do go wrong in some particulars, adjustment can be made in these particulars without destroying the whole structure. Our method thus does not just give us projections for 1975; it also provides the framework for the continuous adjustment of these projections to take account of new facts as they come to light.

This task of continuous adjustment is, in my view, terribly important, and applies not only to the projections, but also to the policies derived from them. It would be stupid for us, as a society, to ignore the materials problems we now foresee and do nothing about them; but it wouldn't be much less stupid if we prepared against the problems as we now see them and turned our eyes to other things for the next generation.

2. W. S. Woytinsky

Director of Research, Twentieth Century Fund, Inc.

IS IT worth while to guess about a year as remote as 1975? In my opinion, this date is remote enough to permit a discussion free from any political consideration and at the same time close enough to be of practical interest. In fact, those of us who are approaching the age of fifty have a good chance of still being alive in 1975. Those who have young children can visualize them as maturing in the 1970's. Moreover, most things people are doing now—the houses and highways they are building, the business enterprises they are developing, the research they are conducting, even the books they are writing—are things planned on the assumption that they will still be in existence in 1975.

A MEASURE OF HOPE

Although we do not know what will happen to us, our cities and our way of life in the coming two or three decades, we cannot live

unless we assume that there is a future for us and that the nearest section of the road ahead runs through more or less familiar scenery. The point on the horizon is not necessarily the immediate goal of our travel, but it shows the direction.

I feel, therefore, in agreement with the authors of the report in their attempt to visualize the situation with respect to the resources of the United States and the rest of the free world a quarter of a century from now. This does not imply, however, that I agree with all their projections.

The Report rests on three groups of assumptions: one dealing with the growth of population and labor force; another with the over-all growth of productivity of labor; and the third with the growth in the different parts of the economic system.

PROJECTION ON POPULATION

The assumptions related to population and the labor force have been furnished to the President's Materials Policy Commission by the Bureau of the Census. Total population in 1975 is set at 193 million, population over fourteen at 146 million, and the labor force at 82 million. It is assumed that, of the latter, 4 million persons will be in the armed forces and 2.5 million out of work. This reduces the employed civilian labor force to 75.5 million. All these projections are defensible in the sense that none of them falls outside the range of possible developments. It is, however, a question of judgment whether they describe the most probable course of events.

The population of the United States was 142 million in mid-1946 and close to 157 million in mid-1952. The increase averaged 2.5 million annually. If this rate of growth is maintained, the United States will have 215 million inhabitants by 1975. It is true that the 1946-1952 increase was partly due to immigration. But this factor cannot be disregarded in projections for the coming years. Even if immigration quotas for Northwest Europe are not fully utilized and no provisions are made for admission of special groups of immigrants, a continuous inflow of 200,000 to 250,000 persons a year seems fairly probable.

The Bureau of the Census anticipates a decline in the birth rate. Such a decline has been predicted since 1945, but we still have 23 births per 1,000 of population; and this rate is the more impressive since the men and women who are now in the ages twenty-one to twenty-five belong to the generation born in 1927-1931—the years with the comparatively small numbers of births. During the next five years the age class twenty-one to twenty-five will comprise those born in 1932-1936, then larger year classes will enter the scene. The babies of the 1940's will become fathers and mothers in the 1960's, and a new bumper crop of babies can be expected at that time.

All in all, the figure of 193 million for the population in 1975 impresses me as rather conservative. The understatement in the projection of the population fourteen and over is, of course, less serious. But the population of working age in 1975 will include fifteen year classes of persons born after the upturn of the birth rate in the early 1940's and probably 3 million to 4 million new immigrants. I would therefore estimate our population of working age in 1975 at 150 to 155 million rather than 146 million.

The proportion of workers (including the armed forces) among persons fourteen and over will depend upon many factors—economic, psychological, and purely statistical. The report assumes a rate of 56%. Currently the annual average rate is closer to 58%. Unless it declines in the near future, our labor force in 1975 is likely to be close to 87-89 million.

ARMY SIZE PROBLEMATICAL

Moreover, I am not sure that 4 million men will be in uniform at that time. This estimate rests on the assumption of a protracted cold war. Such an assumption is defensible, but other assumptions seem more plausible. A showdown can come long before 1975 and, whatever its result may be, we will either not need to keep 4 million men under arms or not be able to maintain armed forces of this size. On the other hand, neither a universal disarmament, with a substantial reduction of standing armies, nor their reduction as a result of the changes in the technique of modern warfare can be ruled out.

Assuming 1 million men in the armed forces, our civilian labor force would amount to approximately 87 million, on the average, in 1975. With an allowance of 2.5 million unemployed, the *employed* labor force could be set at 84.5 million rather than 75.5 million as in the Report. The difference between the two projections is only 12%. If, however, we start from the employed civilian labor force of 60.1 million in April, 1952, it appears that my projection allows for an increment of 24.4 million as compared with 15.4 million in the Report.

PROJECTION ON ECONOMIC GROWTH

I have no quarrel with the assumption for economic growth used in the Report—an average annual rate of growth in output per man hour of 2½%. The Report is on the defensive in introducing this assumption: "The assumed rise in man-hour productivity," it points out, "is somewhat in excess of the historical 2.1% per year, but continued high employment, together with a rate of increase of capital per worker somewhat in excess of that which prevailed in the past quarter century, should make such growth feasible."

This part of the projection depends in my opinion, on assumptions for political development. The assumption of twenty-five years of

undisturbed peace implies a different trend in production than the assumption of an atomic war with a wanton destruction of cities.

Moreover, let us assume that most unfavorable course of political events: a decade of futile cold war, the growing dissatisfaction of public opinion, the rise of isolationism, the withdrawal of the United States from world affairs, the triumph of totalitarian despotism on the fringes of the Free World, and the fall of the last strongholds of democratic civilization in Europe. The trend of production in the United States, reduced to the role of an island of political and economic democracy in the ocean of a hostile civilization, would probably be downward rather than upward.

The Report does not elaborate on the political background of its economic projections, but its estimate of armed forces of 4 million in 1975 suggests that the authors envisage a permanent cold war. This is a fairly pessimistic assumption. If I accepted it, I would consider the 2½% rate as too high. On the other hand, a substantially higher rate of growth could be expected if the projection were based on the assumption of the triumph of the forces of freedom in the world in a not too remote future. However, as an intermediate hypothesis against a vague political background, the Commission's assumption is as good as any other.

The projections for the growth of different parts of our economic system are presented in the Report in terms of the future demand for different raw materials, estimated on the basis of a detailed analysis of available records. Nowhere did I come across a figure which would impress me as indefensible. But in many instances the projections are on the conservative side. The assumption of retardation in the growth of demand for consumer durable goods is not very convincing. A comparison of the composition of consumer expenditures in the United States and other countries suggests that we spend more for certain types of durable goods—such as automobiles, radio and television sets, and electrical house appliances—but are not very well provided with other durables such as furniture, books, and the like. The improvement of housing conditions promises a vast market for those and other durable goods. Likewise, one could expect larger outlays for clearing slums, air-conditioning urban dwellings, replanning cities, and developing of highways and airways.

PERHAPS A GREATER URGENCY

The Report stresses repeatedly that it uses the date 1975 as the middle point of the decade 1971-1980. To some extent, this reservation reconciles its projections with more optimistic or more pessimistic forecasts. The Report shows the trend in the demand for various raw materials by portraying the supply-demand relation which it anticipates will develop sometime between 1970 and 1980.

Using another system of assumptions, we would arrive at the conclusion that the described situation would be reached somewhat before 1970, say between 1965 and 1970. Such a correction not only does not invalidate the practical recommendations of the Report, but strengthens them by making the search for new resources still more urgent.

PROPRIETY OF UNDERSTATEMENT

One last point remains in appraising the assumptions and projections of the Report. Accepting without reservation its practical conclusions, I ask myself whether the case could be presented to the public in a more convincing way on the basis of more dynamic assumptions. And I must confess that I am not at all sure that such a shift of assumptions would be advisable. In controversial issues, understatement is a minor evil in comparison with exaggerations.

As an example, I would compare the conservative population projection of the Report with the estimate offered in 1890 by H. S. Pritchett, Professor of Mathematics and Astronomy at Washington University. Extrapolating a mathematical formula (a parabola of third degree) fitted to Census data from 1790 to 1890, he found that by the year 2900 the population in the United States would be close to 41 billion. "These figures," he concluded, "are suggestive, to say the least. With growth of population, our civilization is becoming more and more complex, and the drafts upon the stored energy of the earth more enormous. As a consequence of all this, it would seem that the life in the future must be subject to a constantly increasing stress, which will bring to the attention of individuals and nations economic questions which at our time seem very remote."

The questions he had in view are conservation of natural resources, elimination of waste, and search for new raw materials. These problems are not remote any longer; we are living in the midst of them. Pritchett tried to dramatize them with such strong arguments as the needs of a population of 41 billion in the United States in 2900. The President's Commission has shown that the situation will be serious enough with a population of 193 million in 1975.

What About Our Mineral Resources?

1. Samuel G. Lasky[1]
United States Department of the Interior

IT WAS the deep conviction of the President's Materials Policy Commission—and my own personal conviction as well—that the welfare of the United States is bound up with the welfare of the

[1]Formerly on staff of the Commission.

free world. Mr. Woytinsky dissenting, it is also my personal conviction that this struggle with Communism will be with us from now on out—ten years, twenty years, fifty years. At any rate it will probably bridge the period we are talking about.

This is a struggle between the free world and the communist world. Consequently, and despite the fact that the United States must carry the burden of the struggle, the free world's supply of mineral raw materials must be considered as available for the use of the free world and not as a supply we can draw upon at our pleasure. This is true whether we agree to having it that way or not.

PRESSURE FROM THE FREE WORLD

With 10% of the free world population, the United States consumes close to half the free world supply of materials. How long do we think the other nations will permit that condition to continue? The peoples of the world who have recently escaped from colonialism have become ultranationalistic in the process. They too want a high standard of living. They would like to use for themselves the raw materials they used to export—at least to process them to a higher form of use, or to control their marketing: Iran with oil, India with manganese, Malaya and Indonesia with tin. Other nations, too, are heading in the same direction: Bolivia and its tin mining, Venezuela and its desires to create a steel industry, Chile and its control over the marketing of its copper production. . . .

All these factors spell a great growth in the world demand for metals and minerals, with the pressure toward a more even distribution of consumption.

"From Abundance to Scarcity by 1975?" Question mark. But a big question mark or a little one? The question itself—the subject of this symposium—would seem to imply that the United States is now abundantly supplied. Is it? Just what do we mean by the words "abundance" and "scarcity?" No nation is completely self-sufficient. No nation supplies itself from within its own borders with all the minerals and metals it needs.

WE BOTH HAVE AND HAVE NOT

Ever since World War II there has raged in this country, off and on, a controversy as to whether the United States has become a "have-not" nation. Those acquainted with our riches seem to lose sight of our shortages; those aware of our shortages seem so impressed by them as to forget our riches. The truth is that the United States is rolling in wealth, as it were, with respect to many mineral raw materials but is poverty stricken with respect to others. Our factories, our shops must have a hundred-odd different metals and minerals in order to make the things we want and use—including atomic bombs

and amphibious jeeps. About a third we get from our own resources in all the quantity we want; and we will continue to get them there for a long time—such things as coal, fertilizers, salt, and construction materials. No shortage there.

Another third we get and almost always have gotten completely—or nearly so—from abroad; but we have become so accustomed to that dependence that we forget it. Tin, nickel, ferrograde manganese ore, spinning quality asbestos, and others. The rest we get partly from abroad and partly from our own mines and wells—copper, lead, zinc, tungsten, fluorspar, iron ore, petroleum. This is the group we always think about when we talk of shortages; more narrowly still, usually the nonferrous metals, and more recently iron ore and petroleum.

MORE SHORTAGES NOW

In times past, we produced enough of some of these so that we had an exportable surplus. But beginning (on long-term average) about the early Thirties for copper, the late Thirties for zinc, and the late Forties for petroleum, the United States has, commodity by commodity, crossed the threshold from net exporter to net importer. For iron, domestic demand and supply have been about in balance, but it is now dramatic public knowledge that our steel mills are planning on an increased foreign dependence. In 1950, we imported an over-all average of about 40% of our consumption of this general group of "shortage" materials. By 1975, we are likely to be importing 50% or more. Generally speaking, the trend relation between supply and demand is something like a flattening off of our domestic capacity to produce but a continuing climb in our capacity to consume.

In detail, this trend ranges from a decreasing dependence for fluorspar (because of the probability of getting fluorine from phosphate rock) to a doubling of dependence for tungsten. For copper, lead and zinc, by 1975 we will be importing, say, about twice as much new metal as now. For lead, I am more bearish than is the Paley Commission.

ALSO SOME EASING OF DEPENDENCE

On the other hand, if we consider the whole group of minerals considered by the Paley Commission, including two items—molybdenum and sulphur—of which we have an exportable surplus, and a number for which we are completely dependent on imports, our over-all average percentage dependence may remain about constant, or even drop. That is because we seem to be on the way toward engineering ourselves out of dependence on diamonds, mica and quartz crystals by developing synthetic or other substitutes for them. That bright spot, however, is certainly no basis for minimizing our increasing dependence with respect to the crucial bulk materials.

How are we going to make up the indicated deficits? Where may we get them? The geographical answer is fairly simple because the supply areas are well established: Africa and South America for a great variety of metals and minerals; Canada and Mexico for some; India for some; Malaya and Indonesia for tin; the Caribbean region and the Middle East for oil. Africa is a particularly fabulous region. But the United States cannot draw to the full upon all these sources. The growing demands of the rest of the world have to be satisfied too.

The facts of geology determine where the people of the world may attempt to increase their supply; the fact of geography and the character of nations determine who gets how much of whatever is found. Our major imports of copper, for example, will have to continue to come from Canada and South America; Africa's first production will have to continue to go to Europe. Our major imports of lead will continue to come from Canada and Mexico; and oil from Venezuela. We are looking toward Canada, Venezuela, and Liberia for the iron.

SKILL, DIPLOMACY AND CAPITAL

Whether the world finds the quantities of raw materials it needs will depend largely, it appears, upon American technical skill, American industrial diplomacy, and American capital. Other nations have their share of mining engineers, geologists, and metallurgists, but we have the bulk of the world's supply—and we have the money. But Dr. Mason will discuss money for you later.

The nationalism we see erupting throughout the world, the growing populations, and the struggle between communism and freedom have conjoined to create a world demand for materials that, as time goes on, we will find tougher and tougher to meet. We speak glibly about an ever-increasing standard of living. Well, conceivably we may find that we have to run like hell to stay where we are.

We are far from helpless, of course, because there are several effective things we can do. We can look for new deposits. But, in order to be as successful as the situation demands, we need far better techniques and instruments than we now have. And we must know more about the geology of mineral deposits.

We can make better use of the deposits we already have by increasing our ability to get the ore out of the ground and the metal out of the ore and by improving our ability to treat submarginal grades. The fact that at present we recover only about 40% of the oil in an oil pool is an example of what we might do; the attack upon the taconite iron ores is another example.

We can learn to use abundant materials—such as shale as a source of oil; coal as a source of synthetic liquid fuels and of additional chemicals; clay as a source of aluminum. We can waste less by making materials last longer and by increasing scrap recovery. We can make

more and more synthetic materials—like plastics, for example—from the abundant resources we have, in order to ease the strain upon the supply of natural materials.

EXPLOITING "UNEMPLOYABLE" MATERIALS

Above all (though I would not care to prophesy whether this step will be in real effect by 1975), we can learn to use such presently unemployable resources as calcium and silicon. Aluminum, magnesium and titanium were once in this category and, in fact, magnesium and titanium are not yet wholly out of it. For titanium, we have taken but the first step. We have been struggling with magnesium for twenty-five years. For aluminum, it has taken us sixty-five years to get it to its present position.

Yes, we can work along all these directions, and we are certain of some degree of success in each of them. The biggest challenge is to achieve the success without raising prices. I, as a geologist, am not rash enough to try to prophesy 1975 prices, but the studies of the Paley Commission do indicate that there will be strong pressure toward higher prices for a number of mineral commodities. For example, the world supply of lead and bismuth may be so short as to cause a severe relative rise in price. Increases are expected also in the prices of chrome, nickel, tungsten, and sulphur, but not necessarily for copper or zinc.

As for petroleum, any upward trend would meet a ceiling imposed by the cost of producing oil from shale and synthetic liquid fuels from coal.

Similarly, the cost of producing aluminum from clay will impose a ceiling on any upward price of aluminum.

And now to summarize. I can do it in one sentence: the outlook is for an acceleration of demand, increasing difficulty of supply, an increasing challenge to technology, and an upward pressure on prices. I am disturbed when I hear some of my colleagues blithely say: "Oh, there's nothing to worry about. We've always managed in the past, haven't we?" That "Lord-will-provide" attitude! Optimism and faith are desirable attributes, but a lot of good hard thinking and hard labor are needed too. In a peaceful world, faith that technologic progress would keep up with the demands of society probably would be justified.

But we do not live in a peaceful world, and one of the agonizing facts about it is that the technologic and scientific brains that we would count upon to increase the supply of raw materials and reduce the demand are diverted toward creating instruments of war that increase the demand.

From Abundance to Scarcity by 1975? Let us say, rather: From a period when America was abundantly supplied by the world (in-

cluding itself), to a period when, in the face of greater requirements, America must share the *free* world's supply more uniformly *with* the free world.

2. Joseph Zimmerman

Editor-in-Chief, Daily Metal Reporter

AS a newspaper man my work consists in dealing with hard facts; and, by the standards of Professor Harberger, I should be classified as a skeptic. And I am a skeptic where theoretical projections over a period of twenty-five years are involved.

FINDS SKEPTICISM USEFUL

I have not forgotten, for example, that only a few months ago government economists and statisticians predicted that we were going to be faced with a serious lead shortage—not twenty-five years hence, but this year. The same economists and the same statisticians advised the domestic consumers of these metals to look about for substitutes, because there would not be enough lead or zinc to satisfy the needs of the civilian economy as well as defense reqiurements.

I do not know how many of you follow closely the lead and zinc markets. Those not familiar with these markets can gauge the extent of the serious shortage when I say that since the government made the predictions, the price of lead has dropped from 19 cents a pound to 15 cents, and is now back to 16 cents. And the price of zinc has dropped from 19½ cents a pound to 13½ cents and is now back to 14½ cents. As a matter of fact, the trouble appears to be that there is too much zinc being produced at the present time.

There are two associations, the Lead Industries Association and the American Zinc Institute, both of which are staffed with experts who know about as much about these two metals as anybody who helped compile the Paley Report. These two organizations are now going out of their way to tell the consumers of lead and zinc: "Don't worry about shortages and don't look for substitutes. We have enough of these metals to satisfy your requirements."

HOW MEASURE THE IMPONDERABLES?

The Paley Commission forecasts a serious metal shortage by 1975. According to Dr. Woytinsky's analysis, I probably shall not be living by 1975 and so shall not be able to point out some of the errors that the Commission may have made in its forecast. However, as an editor who has been closely connected with the nonforrous metal industry for more than a third of a century, I have seen a great

many of the forecasts that were made twenty-five years ago, and also a few years ago, go to the dogs simply because the forecasters could not possibly evaluate the many imponderables in our complex economy, which has been made more complicated by the atomic age.

As far as the metal supply-demand situation is concerned, what I regard as being far more important than the statistical forecasts is: "What can be done about them?" I should like to rephrase the question: "What does the Paley Commission propose that we do about the metal shortages that we are going to have in 1975?"

I listened with a great deal of interest to the admirable address that Mr. Paley made this afternoon. As I listened I said to myself: "If that is all that is contained in the five volumes that the Paley Commission compiled, I would have no place on this platform this afternoon. If the recommendations that Mr. Paley outlined in his address were the basic recommendations of the five-volume Report, I could find no fault with them; nor do I know anybody who would.

QUESTIONS THE COMMISSION'S PHILOSOPHY

I read the Commission's five-volume Report, at least those parts that deal with metals; and while the recommendations that Mr. Paley made in his address are good, I have found some recommendations in the Report that I consider bad. Some of the recommendations made by the Commission are based on a political and economic philosophy which, if put into practice, would serve to undermine our present system of private enterprise.

Let me illustrate what I mean. When I began reading the Paley Commission Report I was greatly impressed by what appeared to be the Commission's credo. On page 3 of volume I, I came across this very significant statement:

> "We believe in private enterprise as the most efficacious way of performing industrial tasks in the United States. With this belief, a belief in the spur of the profit motive and what is called 'the price system' obviously goes hand in hand. This method, motive, and system have served uniquely well in America."

And listen to this sentence, which is still a part of the quote:

> "We believe in a minimum of interference with these patterns of private enterprise."

Bearing in mind that this sound principle came from a Commission that had been appointed by an Administration whose political and economic philosophy is based on New Dealism and Fair Dealism, I could not help but think of that famous line in Shakespeare's "Merchant of Venice:" "A Daniel has come to judgment."

However, this feeling of satisfaction and approval did not last

very long, because the Commission's statement was followed by a vexing three-letter word spelled b-u-t. I was to come across this three-letter word time and again in the Report until it finally took on the role of a danger signal. Every time the Commission praised the private enterprise system I began to look for a b-u-t, and it was usually there.

Private enterprise, the profit motive, the price system are all good in the Commission's opinion—but, says the Commission (and bear in mind the sentence I quoted before):

> "To believe in a minimum of interference is not to believe that the minimum must be set at zero."

When you read this statement you ask yourself: How much above zero does the Commission want the government to interfere with business? As I read the Commission's recommendations I was shocked by the degree, or by the number of degrees above zero, that the Commission favors government interference. At times the degrees were so near the boiling point that, if we were to put the Commission's recommendations into practice, the private enterprise system as we know it would be a cooked goose.

I say this advisedly, because as I read the Report I got the feeling that no matter what industry did, and especially the metal industry, better results could be obtained through government control and supervision. I began to wonder, as I read the Report, whether our capitalistic system, and our private enterprise system, which made this country the greatest in the world, supplying our civilian requirements in times of peace and becoming the arsenal for the democracies of the world in times of war—whether this private enterprise system had outlived its usefulness, whether it had become so decrepit, so outmoded, and so old that it required government crutches to support it.

ITS MEANING OF "MINIMUM"

This is no idle flight of the imagination. Let me quote you the Commission's own words:

> "It is the Commission's belief that the bulk of the task of insuring adequate future supply can best be carried out by private business under the competitive market structure, operating within the broad policy outlines which it is the responsibility of government to provide."

In other words, the government is to call the tunes and business is to dance to them.

The Commission admits that some government activities, or what I would term government meddling with business, have been

inconsistent and badly coordinated, such as market guarantees, government loans, long-term purchasing contracts, international allocations, utilization of counterpart funds, stock piling, etc., etc. But the Commission believes that these activities can be improved upon. Again you sit back and ask yourself: if the government is going to meddle to an even greater extent with business, what guarantees are that the inconsistencies and poorly coordinated activities will be improved upon? And who is going to do the improving? Will it be the social planners, the political bureaucrats in Washington who know little about business, and seem to care less?

ARE THERE SUPERMEN IN GOVERNMENT?

You ask yourself: who are the supermen in our government who are so superbly equipped through training and experience to be able to tell the metal-mining industry how to conduct its business, or how to market its commodities?

It is because the metal-mining industry has been a private enterprize and has functioned under private management that it has achieved a stage of development second to none in the world. Therein lies the danger of the Paley Commission's philosophy and its recommendations; namely, that anything that private industry can do, the government can do better.

Nor can I agree with the Commission when it takes as one of its main tenets that "it is the function of the government to reduce market instability." The Commission makes a great to-do about the market instability in metals.

I was brought up in the old school that it was the law of supply and demand, rather than government laws, that determined market trends. As a matter of fact, events have proved that every time the government has interfered with the law of supply and demand, we have had greater market instability; and, of course, the taxpayers have had to carry the burden.

CITES BRITISH EXAMPLE

Let me give you an illustration. The recent Labor government in England tried to eliminate market instability through a system of bulk buying. The British government was the sole buyer and sole seller of metals in England. How did the plan work out? Here is a very simple example: In June of last year, when there appeared to be a serious lead shortage and there was panicky buying in the lead market, the British government aided and abetted the panicky feeling by entering the market and buying thousands of tons of lead, first at 22 cents a pound, and later at 21¾ cents a pound. That was last year.

Early this year the British government unloaded 53,000 tons of this lead upon Uncle Sam at 19 cents a pound. Today's price is 16 cents a pound.

In retrospect, there is no doubt that the British government made a bad mistake when it bought lead at 22 cents a pound which it later resold at a great loss. That does not means that private individuals do not make similar mistakes. Of course they do. But when they do, they themselves, or their company, or the company's stockholders, bear the loss. But when the government makes a mistake then it is you and I, the taxpayers, who have to foot the bill, and the government being big, the mistakes it makes are usually whoppers, and we all pay for them.

The present British government is gradually discarding the bulk buying plan because it does not work. The Paley Commission does not recommend a bulk buying plan, but it does recommend other plans for avoiding market instability; and it is these plans that I regard just as dangerous and just as hazardous.

HOW ALLOCATIONS CAN CRIPPLE

For example, the Paley Commission favors the International Materials Conference plan, which seeks to limit, by means of international allocations, the amount of copper and nickel and zinc, and other metals, that we in this country may consume. We have had a taste of the effects of this plan on domestic industry.

Let me give you a concrete illustration as to what happens when our government, in cooperation with other foreign governments, tells private industry how much copper or other metals may be consumed. The Scovill Manufacturing Company, of Waterbury, Connecticut, is the world's largest producer of steel and brass safety pins. The company produces hundreds of other items, but with respect to safety pins it stands first in the world. The government prohibited the company from making the kind of safety pins it always made because the raw materials that the company needed were going abroad. The company's foreign competitors, however, were able to produce the pins that Scovill's customers wanted; and today these foreign competitors enjoy about 25% of the total market in the United States, and Scovill can't do a thing about it.

Now multiply this situation a hundredfold, or a thousandfold, and we get an idea of what is likely to happen to American private industry if we were to follow the Commission's suggestion that "the United States should take the initiative in urging more vigorous international action to solve trade and distribution problems that can be dealt with effectively only on an international basis."

As a means of reducing market instability, the Paley Commission favors the creation of buffer stocks of metal. It favors the creation

of an international agency to manage the buffer pool; and this agency would have the power to decide what metals to buy, when to accumulate, and when to sell. The governments would own these metals and could dump them on the markets when they saw fit. Uncle Sam, of course, would have to bear the cost of the plan.

The international agency would also have the power to impose quotas on production, sales, and imports as a means of eliminating sharp market fluctuations. If that is not market manipulation of the worst kind, I don't know what is. We have had such buffer pools in the past. Private industry tried them and they failed, because they interfered with the natural functioning of the law of supply and demand.

The Paley Commission, however, is convinced that its own buffer pool, along with its quotas and limitations on use, would not fail simply because it would be inaugurated by governments and would be controlled by governments. In other words, where you have a government cartel, or a government commodity agreement, or government market manipulations, they are good, *per se*, simply because they constitute legalized meddling with the law of supply and demand, and with private enterprise.

COPPER AS AN EXAMPLE

In spite of the many protestations by the Paley Commission that it is in favor of our private enterprise system, as I read the Commission's report I got the distinct impression it believed that the private enterprise system can only function successfully under government meddling, which the Commission calls government control or supervision.

We are now reaping the benefits of such government meddling in the domestic copper market. Those of you who are in the metal business know the situation that now prevails with respect to the price of copper. Copper of domestic origin may only sell for 24½ cents a pound, while copper of foreign origin may and does sell at 36½ cents a pound.

Let me read you a few words by one who is universally regarded as the dean of the copper industry, a man older than I am, certainly far more experienced and far wiser than I am. I have reference to Cornelius F. Kelley. He is the chairman of the board of the Anaconda Copper Mining Company. In a recent address he said:

> "What possible justification can there be for the autocratic control imposed upon as important a metal as copper, the importation of which is a vital necessity to both the defense effort and peacetime requirements, when it has been demonstrated that all the bureaucrats can do is handicap and hamstring the domestic

producers, while foreign governments and producers truly have the benefit of that much talked about free enterprise which is supposed to be an American tradition but which today is a national farce?"

I think what Mr. Kelley said points up very effectively what happens when government meddles with commodity markets.

FEARS THE CURE MIGHT KILL

Even if the social planners could guarantee us the market stability that is envisioned by the Paley Commission, I doubt whether it would be worth the price we would have to pay. I am very much afraid that the cure recommended by the Commission to eliminate the evils which it believes are inherent in the private enterprise system might kill the patient.

The answer to the question: "Mineral Resources: Do we have enough and what can be done about them?" should be, in my opinion: "To be assured of an adequate supply let the private enterprise system function without government meddling."

Energy: How To Keep Things Moving

1. Philip H. Coombs[1]

Director of Research, The Fund for the Advancement of Education (The Ford Foundation)

I WANT to confess right at the start that I have just had a shocking revelation. I had not realized that for seventeen months I was unwittingly engaged in a plot to destroy the American free enterprise system, and to take safety pins away from the diapered babies of America.

There are some very valid criticisms of this Report. But one which I can regard only with humor is that which describes this Report as a "deep dyed plot" to destroy the very system it was dedicated to strengthen. Any such charge, however eloquently made, will be regarded as sheer nonsense, I feel sure, by any reasonable person who reads the Report with care. It will be regarded, moreover, as unfair, not only to the five public-spirited Commission members and their staff but to this very audience, which the Report seeks to assist, and to the many businessmen, editors and others who have found much merit in the Report.

The main contribution of the Report in the field of energy was perhaps to place its focus, not upon the individual sources and forms,

[1]Executive Director of the Commission.

but upon the energy situation as a whole, and to recognize that there is a high degree of interchangeability and interdependence among the various forms and sources of energy. Well over 50% of the present consumption uses of such fuels as coal and oil and natural gas could physically and technically be satisfied by an alternate fuel, though under present price relationships it wouldn't pay to shift.

This great flexibility in the energy picture, both on the resource side and on the use side, if properly utilized in the years ahead, could help us tremendously in meeting our energy needs. With improvements in technology of production and use, and with reductions in real cost, we could shift our reliance steadily away from the less abundant toward the more abundant forms of energy, and we could make more efficient use of all forms.

The Commission placed great stress upon the vital role of energy in national economic growth, and thus accorded it a separate set of chapters in the Report. Energy it regarded as the Siamese twin of technology in increasing productivity, thereby raising national output more rapidly than population and permitting real incomes and living standards to rise.

All one has to do to observe the contribution of energy to economic growth is to study the trends of our economy. In the first half of this century, national output of all goods and services increased nearly five times, while population roughly doubled, thereby spelling higher income per capita. But energy in the same period increased in step with total output, or about four and one half times. Thus man-hour output rose steadily as more and more energy, along with more and better tools, was used per worker.

NEED FOR DOUBLE THE SUPPLY

The Commission makes the rough projection that if we are to double national output again in the present 25-year period, we must likewise roughly double our supply and consumption of energy. This is in line with past experience. However, the ingredients of the total energy stream will change in the future as in the past. If this were not possible, we would have great difficulty in meeting our future energy needs.

A look at the past shifts in the composition of the energy stream provides an idea of what can happen in the future. Back in 1900, coal used to account for better than 90% of all the energy our economy used, whereas oil and gas together accounted for less than 10%, and water power for the remaining 1% or 2%. But, by 1950, with total energy consumption having grown four to fivefold over 1900, coal had fallen from 90% of the total stream to 40%, whereas oil and gas had risen from less than 10% to better than 50%.

In the quarter century from 1925 to 1950, there have been dra-

matic changes. Petroleum use rose two-and-one-halffold, water power fourfold, natural gas fivefold, and electricity has been doubling every ten years. These increases, which are above the average for total energy growth, were compensated by coal, whose tonnage use failed to rise and whose percentage role in the total energy stream dropped sharply.

These shifts were brought about through the price mechanism—through changes in market demand and in relative costs and prices. These latter changes in turn reflected great improvements in the technology of energy production and use, including the growth of the automobile and airplane with their fabulous appetite for liquid fuels, and the wide application of electric motors and lighting. The competitive position of different forms of energy changed steadily through the years, to the considerable disadvantage of coal.

Let's look briefly at the major energy resources we have available to meet a doubled energy demand by the '70's and at some of the cost pressures in the energy field. In the water-power field, where there is much debate over the best means of developing electric power sites, the fact appears to be that we do have remaining some excellent hydropower sites which will be thoroughly economical to develop, whether privately or publicly. This will be well worth doing, but water power cannot provide the major solution to our total energy needs because of physical limitations imposed by nature. We might be able to as much as double the total amount of electric energy supplied from water power in the next twenty-five years.

The average real cost of energy developed at the new sites would be somewhat higher than at present sites, but it would nevertheless be worth while; and there are a few large and quite low-cost sites still undeveloped. But, at best, water power would still satisfy only about 2% of our total energy demands by 1975, and about one quarter or less of the demand for electric energy.

THE ENIGMA OF PETROLEUM

Petroleum is the great enigma of our energy outlook. The Commission did not attempt to project what will happen to domestic petroleum production. It would not have been prudent to do so because nobody knows. The estimates of various experts vary all the way from a sharp decline by 1975 to a doubling or trebling. How the big question mark of future domestic petroleum discovery and production gets answered is going to have very important repercussions on such other energy sources as natural gas, coal, shale, oil, imports and the like. It should be possible, with the help of imports and synthetics, to meet our future liquid fuel requirements without drastic cost increases.

As for natural gas, that too, along with petroleum, is a big

question mark. It may make an even greater contribution in the future than at present, or it may hit a plateau soon and gradually decline. But certainly, with both petroleum and natural gas, we are not suddenly going to stop finding them nor will production suddenly collapse.

Coal stands as the great white hope for the long run in the energy field, for coal is by all odds our most abundant reserve of fuel; and it lends itself flexibly to conversion into secondary forms of energy, notably electricity and liquid fuels. Backing up these regular coal reserves, we have very large reserves of what to date have been submarginal solid fuels, such as shale, lignite and the lower-grade forms of coal.

The big problem is that of finding and of applying improved technology of production, transportation, conversion and utilization which will cut costs and put these vast stores of solid fuels to work on a much larger scale.

Finally, we have the unconventional sources of energy which hold great promise but to date are beyond prediction for success, notably solar energy and atomic energy. In the atomic field and to some extent in the solar field, experimentation is going on which is very encouraging. But the Commission doubted that by 1975 we could expect a very significant fraction of our energy needs to be met economically from these two sources. Looking well beyond 1975, however, it is clear that we must ultimately depend particularly upon solar energy as the "fossil fuels" get exhausted.

TAKING ADVANTAGE OF OPPORTUNITY

Now, what kinds of general actions are needed to take advantage of the opportunities that lie in these domestic resources, and the similar opportunity that lies in the direction of imports, particularly of liquid fuels? Broadly, the Commission felt that one of the most important things we all need to do—and this is not just a job for government—is to maintain a continuing, intelligent, over-all look at the energy situation as it unfolds, as a basis for intelligent action. It is not enough to view each source and type of energy separately, or to view domestic energy needs and resources apart from foreign; all must be examined as interrelated parts of a whole.

Secondly, it is clear that throughout the energy field there must be a continued vigorous pursuit of improved technology, not only in the exploration and production of fuels, but in their utilization.

Third (and I hope the previous speaker will take note), it is highly important to keep open the channels of private initiative. In order to let competitive cost and price adjustments stimulate the kinds of healthy shifts in the energy stream that are required, the market mechanism must be kept working well, and guarded not only

against needless government restrictions, but against private restrictions as well.

Fourth, there is need for a fuller and more vigorous application of some of the conservation principles already in use, especially in the field of petroleum and gas, and also in coal.

If there were time I would like to review more specifically some of the major directions of change and improvements which the Commission felt were necessary for each of the individual energy items. Perhaps if there is time for questioning you may want to ask for specifics along those lines.

THE ENERGY PATTERN OF 1975

Finally, if you were to ask: what in general do you think is a plausible shape of the energy pattern by 1975 as compared with now—what role will these different forms of energy play and what will happen to costs—I think that a plausible answer, assuming good adjustments along the way, would sound something like this:

First, our total end use of energy will be roughly 100% greater than in 1950.

Second, the secondary forms of energy—that is, electricity and liquid fuels and coke, which are derived from basic fuel resources—will increase in importance, as they have in the past. Today, they represent something like half of all energy used by the final consumer; they should represent at least 60% by 1975. This increase has an important implication because, when basic energy fuels are converted to secondary forms, there is a substantial conversion loss. It takes energy to make energy out of these basic fuels, so we have an increase in demand against our basic energy resources as we raise the proportion of secondary fuels. Incidentally, this conversion loss today equals about 17% of all the energy we use; and it may be at least 20% by '75.

Third, liquid fuels (not only domestic petroleum but synthetic fuels and imported petroleum) will probably move up in the energy stream from something like their present 35% position to perhaps 40% of a much larger total. This presents a considerable challenge to the petroleum industry.

Incidentally, even though the Commission's projected demand for petroleum, electric energy and chemicals is very high compared with many other materials, I am unaware of any severe criticism of the Report from these industries on the grounds that too bold a future has been painted for them. These industries have been characterized in the past by highly dynamic behavior, by a bold and risk-taking attitude toward growth, and by great emphasis on technology. It seems significant that industries of this sort have not criticized the Report's projections as wild-eyed or its methods as subversive.

Fourth, if exploration efforts continue to prove successful, natural gas likewise may well represent a higher share of the total energy stream by 1975, perhaps going from the present 15% to 20% or 25% of the total.

(By the way, we have been warned for years in this country that we were going to run out of oil in twelve years; it was usually twelve years. We have now gone well beyond the twelve years, yet our current production and consumption are well above where it was then and our reserves are several times higher. But this should not be taken as an argument that we will never have trouble with our domestic oil supplies. Sooner or later we shall encounter the geologic limits imposed by nature.)

Fifth, hydrolectric power, as I have mentioned, can be expanded, perhaps roughly doubled; but it will still be a small factor in the total.

A BIG ROLE FOR COAL

Finally, coal presents perhaps the greatest opportunity and challenge of all in the energy field. There is so much that we are certainly not going to run out of it for several generations at least. Coal can give relief to all the tight spots in the energy field. But the coal industry has a problem. It is made up of relatively small concerns that are not capable financially of undertaking the kind of attack on technology that others, such as the oil industry, can carry out. It holds great promise for expanding our energy stream but it needs a lot of help, not primarily from government, but from the industries which are going to want to use vast quantities of coal two and three decades hence.

The oil industry is likely to end up someday relying on coal for conversion to liquid fuel. Certainly, the electric power industry is already heavily dependent on the coal industry and becoming more so. The chemicals industry also will have to turn increasingly to coal as a source of chemicals. If these great industries and the transportation industries could sink their taproots more deeply into the coal industry, and do it sooner rather than later, the coal industry could avoid going through the wringer once more and could start right now on its inevitable long-run growth curve. Even at best, however, it looks as if the percentage role played by coal in the total energy stream will continue to shrink for some time yet. But since the total energy stream will be growing, the absolute tonnage use of coal, which has been on a dead level for many years now, is likely to start rising in the not distant future.

NO NEED FOR ALARM

This, then, is a thumbnail sketch of what looks like a plausible energy picture for the future. It need not be an alarming picture,

though it will be unless we get plenty of technology, plenty of capital investment, a free market through which these adjustments can come about, better conservation methods than we have had, and a good deal of aggressive expansion of the energy industries all along the line.

2. Eugene Ayres[1]

Technical Assistant to the Executive Vice President, Gulf Research and Development Company

I SHALL NOT waste time by adding my superfluous bit of praise to the chorus of approval of the work done by the Paley Commission. Instead, I should like to point out some of the extraordinary difficulties with which the authors of this report had to contend. Only by understanding these difficulties can some of the figures in the Report be correctly appraised.

No projection of consumption or demand for materials can stand entirely on its own feet. This is repeatedly pointed out in the Report. In every case it has been necessary to make numerous assumptions because of such factors as interchangeability of materials, trends of cost and preference, and probable trends of future technology.

REMEMBER THE ASSUMPTION

To give the Report solidity it has been necessary to select certain conditions as presumably, but by no means certainly, more plausible than other conditions, in order to come out with specific figures. The specific figures are easily and eagerly seized upon, read and widely quoted, whereas even the simpler assumptions are likely to be ignored or forgotten. This is human nature.

The energy pattern of the future is particularly subject to this difficulty. One of the widely quoted sentences in the Report is: "Petroleum is the greatest enigma of future energy supplies." Because of the extent to which fuels are interchangeable, this cloud of petroleum uncertainty casts its shadow over the entire energy picture and particularly over coal demand. This latter is largely a residual quantity. We add up everything and subtract the sum from the total industry requirements, and the difference must be taken care of by coal.

In a Commission's Report, a figure of 60% is mentioned for the increase in coal demand by 1975. I would like to show how this figure may be made three times as great, or 180%. In doing so, I want to emphasize again the fact that neither 60% nor my proposed 180% figure is intended to have any significance except in association with the numerous assumptions on which they are based. I suspect

[1]Mr. Ayres' paper was delivered by Roland C. Widgery

that 60% may be close to minimum and 180% may be close to maximum; even of this we cannot be certain.

THREE DIFFERENT PROJECTIONS

To illustrate the enigmatic quality of petroleum supplies, the Paley Report shows three different projections of domestic petroleum by 1975. These represent various stages of optimism or various ways of interpreting present technology.

In line with the generally conservative policy which I heartily approve in a report of this kind, the most optimistic projection, No. 1, was selected as a working basis. I might remark parenthetically that in petroleum it is conservative to be optimistic because of the disrepute that has fallen on prophets of doom.

A further assumption was made that a deficiency of 1.3 billion barrels in domestic production could be made up at moderate cost by importation. It was also assumed that not only would all the liquid fuel needed in '75 come from petroleum, domestic and imported, but that petroleum would be sufficiently abundant and low in cost to continue to be used to some extent as a substitute for coal or for its b.t.u. content without reference to physical form.

Suppose, instead, that we accept the least optimistic estimate, No. 3, which shows a 3-billion barrel deficiency in domestic production for 1975. Let us further assume that a world deficiency begins about 1965 which grows by '75 to more than 4 billion barrels per annum. In such case, quite aside from costs of production, petroleum demand would preclude the use of liquid fuel for its b.t.u. content alone, domestic deficiency could not be made up by importation, and it would become profitable to make some supplementary liquid from oil shale or coal.

These assumptions are not plucked arbitrarily out of the air. They seem to be forced upon us by geological estimates of ultimate petroleum reserves for the United States and for the world. The only way we can shrug off such conclusions is to say that geological estimates are wrong. This is, in fact, just what some of my petroleum friends are now saying and they may well be right.

HOW MUCH DEPENDENCE ON NATURAL GAS?

Natural gas is even more enigmatic than liquid fuels. Geologists hesitate to make predictions of ultimate reserves of natural gas, but according to the highest estimate yet made, 400 trillion cubic feet, the peak of production should come around 1960. Production should stay up at this figure into the early 1970's, after which a drop in production should be rather precipitous. According to such a picture, natural gas should not be expected to be used to an appreciable extent in 1975 as far as b.t.u. content alone is concerned, without

reference to physical form. For example, its use for generation of electric power should be negligible.

HOW MUCH COAL DIVERSION?

Before coal is converted on a large scale to liquid fuel, two things should happen: (1) The recovery of shale oil and (2) the conversion of residual fuel oil to distillate fuels. Both are dictated by economics. Although our reserves of oil shale are huge, present expectations are that the maximum rate of production of shale oil will not exceed a third of 1 billion barrels per annum. Much more important is the factor of conversion of residual fuel, which may reach about 1 billion barrels per year by 1975.

In the Report it is predicted that the United States demand for liquid fuel in 1975 will be 5 billion barrels. According to the philosophy of the present argument, this would correspond to 4 billion barrels of distillate, made up as follows: from domestic petroleum, about 1.6 billion barrels; imported petroleum, 0.7 billion barrels; oil shale, 0.3 billion barrels; coal, by difference, 1.5 billion barrels, totaling 4.1 billion barrels. Also, according to the philosophy of this argument, a plausible distribution for 1975 of sources of energy for electric power generation might be as follows: from hydropower, 16%; from oil and gas, 5%; from coal, by difference, 79%.

All technologists agree that hydropower must carry a decreasing part of the total load in the future despite the development of great government projects since 1930. The proportion of the total load carried by hydropower declined from 40% in 1930 to 25% today. Sixteen per cent for 1975 seems reasonable, even if we predict a more rapid development of hydropower than is dictated by the economics of a free enterprise system.

A FORMIDABLE TASK

Let us make two other assumptions: that demand for electrical power will increase 260%, as indicated by the report; and that the average thermal efficiencies of power plants will show reasonable improvement by 1975. Then we come out with an astounding total of 420 million tons per annum for electric power generation in 1975. This compares with about 100 million tons used this year.

The over-all coal demand in 1975 can be summarized as follows: The basic coal demand, 450 million tons; generation of electric power, 420 million tons; replacement of heavy fuel oil, 184 million tons; conversion to liquid fuels, 470 million tons. This makes a total estimated demand of 1,524 million tons.

The problem for the coal industry posed by the 60% expansion mentioned in the Report is formidable enough. The problem posed by the 180% expansion is indeed gigantic, with many facets. I would

not presume to say which expansion is the more likely; matured events may prove to lie somewhere in-between. Proponents of the larger expansion feel the stage is set, in the production of coal, for the most vigorous expansion of industrial activity the world has ever known.

AN EXPLOSIVE MIXTURE

Economic factors make up the following explosive mixture:

1. The United States is irrevocably committed to a liquid fuel economy. In peace as in war, transportation and other mobile applications of power have become overriding symbols of our way of life.

2. But just when liquid fuel has achieved its predominant status, domestic petroleum is moving toward a peak of production, which must be followed by a gradual and progressive decline.

3. We are already a net importing nation for petroleum, but just when we shall drastically need to increase our imports we shall be confronted with a world shortage, with all the international difficulties this implies.

4. Our energy supplies are now being vastly supplemented by abundant natural gas, but it seems that the decline of natural gas will be almost coincident with that of oil.

5. In spite of the great reserves of oil shale in Colorado, a number of natural and economic factors will prevent a high rate of liquid fuel production from it.

6. We are at the threshold of new and expanded demands for electric energy for a multitude of purposes.

7. In spite of intensive prosecution of public projects and the very considerable amount of hydroelectric power still to be developed, the proportion of our total electric load carried by hydropower seems already to have passed its peak.

IT MAY COME EARLIER OR LATER

The question may well be asked: If this dramatic picture may be wrong why should we go into such detail about it. The answer is that the picture can be wrong after all in only one fundamental respect—that of timing. The climax of events may come later than 1975, but the climax could come even earlier. Shale oil may play a larger role than is here indicated, but in this case any relief for coal will be offset by oil-shale production problems.

There could be, of course, various adjustments in other ways. It is not too early to do a little industrial dreaming about the energy problems of the future and the recommendations of the Commission should, in my opinion, be acted upon promptly and vigorously.

Foreign Investment: A Solution?

I. Edward S. Mason[1]

Dean, Graduate School of Public Administration, Harvard University

I SUPPOSE that the most publicized aspect of the Paley Commission Report has been the statement, highlighted in newspapers around the country, that within the past fifteen years the United States has changed from a net exporter to a net importer of raw materials. This is an important transition, and I think the Commission has done a good job in stating that fact and documenting it.

OURSELVES A RAW MATERIAL PRODUCER

But statements of that sort—and this is no exception—are apt to be highly exaggerated and their significance distorted. For instance, I have heard it said, and I am sure you have seen in newspapers, that the United States has changed from being a "have" country to a "have-not" country in the materials field. Of course, that is absurd. The United States is still by far the largest producer of raw materials in the world, and by 1975 it is still going to be the largest producer of raw materials in the world. We are not going to be a "have not" country.

I have also noticed that, in England, Aneurin Bevan—certainly no friend of the United States, by the way—has indicated that this country, having exhausted its own resources, is now in process of exhausting the natural resources of the rest of the world. Again, this is an absurd statement. We may, and I think we probably shall, become a larger net importer of materials than we are now. But if we do so, it will only be on conditions that will be quite satisfactory to resource countries as well as to ourselves.

IMPORTS CLOSELY RELATED TO COSTS

Nevertheless, it is a fact that in recent years we have become a net importer of materials and—I want to stress this because I think it is important—we shall become an even larger net importer if those materials are available in the rest of the world under reasonable cost conditions. If they are not available under such conditions, we are not going to become a larger net importer of materials.

When we talk about our net import position we have to realize that it is very largely a net minerals import position. We are still net exporters of food stuffs, although on a very small scale, and from what I can see of the possibility of expanding agricultural activity over the next twenty-five years, there is no reason why we should

[1]Member of the Commission.

not maintain something like that position. If we do become a large net importer of materials in general, it is going to be because of the minerals situation.

THREE MINERALS DOMINATE

When we look at that situation, we can't help but be impressed by the fact that there are three minerals—coal, oil and iron ore—that completely overshadow everything else. The production of ingot steel in the United States is now over 100 million tons. That is more, tonnagewise, than the total output of all other metals taken together in the United States.

When we talk about coal, we are talking about tonnages of 500 million or 600 million tons a year and, although coal is obviously much less expensive per ton than copper, we are comparing an output of 400, 500 or 600 million tons with an output of 1½ million tons. When we talk about oil, we are talking about a value of output and a value of consumption that runs into billions of dollars. When we talk about manganese, we are talking about things that do not run in terms of billions.

So it is an important factor to bear in mind that oil, iron, steel and coal dominate this minerals picture as far as tonnage and value are concerned. In the case of coal, the prospects are that in time we are going to become a larger net exporter. It is really oil and iron ore that we are talking about as important value items—and oil is a predominant value here.

With respect to these items, the rest of the world has large low-cost sources of supply. If these are made available to the United States on reasonable terms, we are going to become a large net importer of these products. If they are not available we are going to turn to domestic sources.

FOR EXAMPLE, SHALE vs. NATURAL OIL

After all, the cost of shale oil is not now greatly in excess of the cost of natural oil. If the price of foreign oils went up by as much as 20% or 25%, the shift to local sources of oil would be very large and the same thing is true of iron ore. Although we are running out of high-grade hematite ores, we have large supplies of taconites which can be developed at not a very great increase in cost and prices.

So I would say this projection of increasing United States net imports, which I think is a reasonable one, is based on the assumption that these materials are going to be available abroad on reasonable terms. This is something the foreign countries have to think of as well as the United States—that we are not going to become a large market for their supplies unless they can come to us on fairly reasonable terms.

I hope and, on balance, expect, that they are going to be available to us on those terms. If we can assume that, then certainly we are going to have in the resource areas of the world a tremendous demand for investment to expand output, not only for those countries' own needs but for the needs of the United States, Western Europe and Japan.

Very large quantities of capital are going to be involved: Are the conditions under which this capital will be available going to be attained? All I am sure of is that the low-cost sources of supply exist, and that, if conditions are propitious for foreign investment, foreign investment will take place and development will expand.

It is in the interests of the United States to get our supplies and materials from low-cost sources if they are available. The United States also has a very important interest that is not connected with its own requirements. We are in a relatively invulnerable materials position in the sense that we can depend more largely on our domestic sources if we have to, even though it involves some increase in costs. But other industrial areas, particularly Western Europe and Japan, are in a much more vulnerable position. Terms of trade have turned quite badly against these areas in the past ten years and if they turn much further—that is, if they have to get their raw materials and food supplies at increasing costs—they are going to be in a bad position.

A STRONG SECURITY INTEREST IN FOREIGN INVESTMENT

The United States has strong interests in seeing to it that those areas are not put in a worse position. We have security programs in Western Europe and Japan that are likely to be seriously handicapped if the terms on which these areas get raw materials from abroad become continuously worse. We have a real interest in foreign sources of supply, not only in promoting our own economic growth by drawing from low-cost sources, but a very strong security interest in seeing to it that other areas of the world can also do so.

In fact, the central problem of the next twenty-five years in the international trade field is going to be how to bring about a balanced expansion of primary and secondary production—an expansion which does not cause the terms of trade to turn too markedly against the industrial areas of the world. We can stand it, but certain other areas can't.

BARRIERS TO PRIVATE INVESTMENT ABROAD

Development of this would require a large investment abroad to maintain the required output. I am sure the Commission thinks—and I personally think—that by all odds the most effective channel of investment is foreign private investment. Most of the develop-

ment to date has taken place at the hands of a relatively small group of large companies that have made risky investments abroad. The focus of the Commission's recommendations in its foreign resources section is on how to see to it that this continues to be the most fruitful way of bringing about an expansion of output. Its recommendations fall into these groups:

First, a series relating to the removal of obstacles to foreign private investment.

A second group turns toward the question of facilitating exploration of resources in these underdeveloped areas; encouraging geological surveys and so on; and making available, through capital assistance and technical assistance, the building of certain auxiliary facilities that are going to be necessary to this expansion of materials abroad.

A third set of proposals has to do with the removals of barriers to trade, and the exports of materials into the United States and into other industrial areas—again, a series of steps necessary to the expansion by foreign private capital of output in foreign areas.

A fourth set of proposals has to do with the limitation of government participation to that small number of cases where one must guarantee prices or must insure the capital risk involved in expanding output of strategic materials—an expansion that would not take place unless these steps were taken.

I think the Commission felt—and I very strongly feel—that government intervention beyond that stage simply tends to dry up the private source of investment.

IDEA OF BUFFER STOCK OPERATIONS

Finally, there is a single recommendation looking toward increased price stability of raw materials prices. Since Mr. Zimmerman has made some remarks about this, perhaps I had better say a word or two in this connection. The purpose of an international buffer stock is not to stabilize the price of materials. It is rather to eliminate the worse excesses of price fluctuations in these materials and to eliminate it by purchase under distressed conditions and by sale under conditions in which countries are facing shortages.

It cannot be properly said that the record shows this to be an ineffective device, because, in fact, there is no record. As far as I know, there has never been an intergovernmental buffer stock operation. The nearest approach to it was a small-scale operation under the so-called tin agreement. Let me say, too, that a buffer stock operation of this sort does not involve any export restrictions at all or any restrictions on output of any kind; it is simply a purchase and sale device.

So, the Commission made this very tentative recommendation: if

you will read the language I think you will see that the Commission recommends the exploration of an international buffer stock proposal to moderate price fluctuations if other countries in the world, principally raw-material countries, show a great interest in this kind of technique. The Commission was impressed by the opinion that a lot of the raw-material countries are resistant to further exploration of raw materials output and exports, since they have in the past encountered very serious difficulties because of tremendous fluctuations in price. After all, in a country like Bolivia, a very large percentage of whose foreign exchange depends upon tin exports, fluctuations in the price of tin will have a tremendous effect. A lot of these raw-material countries are essentially exporters of one or a very small number of materials. If it is true that these resource countries might be more inclined to encourage an expansion of output of their materials for export purposes if some device were provided to get a larger measure of price stability, then the Commission felt something had to be done to meet this particular need. Consequently, the Report includes a very tentative recommendation for further exploration of the possibility of limiting price fluctuations through buffer stock operations.

2. Robert P. Koenig

President, Cerro de Pasco Corporation

Foreign investment by United States corporations and individuals cannot be a solution for the deficiency of all the raw materials which are needed for our economy, either on a defense basis or during the periods of so-called normal economic activity which exist in this century in the periods between wars. It can be a palliative, or at best a partial solution, for some of the deficiencies with which we are or may be confronted.

I don't mean to imply that all the recommendations made by the Committee are necessarily inapplicable; and I do mean to imply that it is quite probable the supplying of many of these deficiencies will be done by means not currently contemplated by those responsible for the Report or perhaps by those of us in the business of running industries in foreign countries. There will probably be some new device or way of doing it within the next twenty-five years.

I will confine my discussion to the mineral industries with which I have some familiarity. While this does not cover the entire field included in the Report, the Commission itself has apparently spent the greater portion of its time and effort in trying to analyze this restricted part of the possible shortage problem.

I have not contributed any measurable amount of my time and energy to following the Commission's deliberations or studying its

conclusions. I have, however, reviewed the analyses and recommendations having to do with investments in foreign countries, principally because my present activities are directed along those lines. One reason why I have not paid more attention to the Commission's work is the belief that little of a constructive nature would flow out of it, since many of the recommendations to stimulate production abroad have to do with tax reductions in one way or another. We all know that tax reductions hardly seem to be the order of the day.

Another reason is that it is inherent in the nature of any such report for it to reflect, to a lesser or greater degree, the economic climate prevailing at the time of its preparation; and thus its value diminishes as the climate changes.

On the first page of the Report, in paragraph 3, it says: "In area after area the same pattern seems discernible: soaring demands, shrinking resources, the consequent pressure toward rising costs," etc.

If this study had been initiated and carried through in the economic climate that exists today, particularly within the nonferrous metals industry, these words would have been modified, since demands are not at the present time soaring, resources in about all fields in the industry are expanding, and prices have fallen. I see little reference to the fact that perhaps the all-powerful hand of Uncle Sam may not be so necessary as it is generally assumed in order to reduce the deficiency of raw materials upon which the Commission's report is predicated.

SEES A SHIFT IN DEVELOPMENT PATTERN

While it is true that in this century the development of mines by American entities in foreign countries has been vast, it is also true that in the past decade—perhaps even before that—there has been an increasing amount of such development done by the nationals of the so-called underdeveloped or newer countries themselves, often with little or no aid from the United States.

I was asked to discuss the recommendations and analyses on investment in foreign countries. A review of that portion of the Report which has to do with this subject demonstrates that the manifold problems confronting investment by United States entities abroad have been exposed by the Commission and its staff to public view, so that anyone who may be lured into making foreign investments by the hope of gain now has a first-rate textbook available.

The Report touches on almost every conceivable aspect of taxation at home and abroad in all its complexities. It touches on exchange rates, currency convertibility, import and export controls or tariffs, political risks, fear of expropriation, investment guarantees, Point IV help (so called), loans from the Export-Import Bank or World Bank, and so on, *ad infinitum*.

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The prospective investor can, if he does not already know about these things, see how they may probably affect what he wants to do; and in many cases he can find recommendations of what will correct what he may deem to be inequities or obstacles for taking foreign investment risks.

The Report, of course, does not give any open sesame to how to put any or all of these recommendations into effect.

Most of these aspects of the complexity of foreign investment and the recommendations made in connection with them are of a technical character and involve matters of accountancy and legal interpretation. Anything less than to attempt to comment on these individually would serve no purpose, and to do the latter would be asking too much of your time and patience.

I think the Commission and its staff have done a good job in assembling in one place, and stating with commendable clarity, the difficulties confronting overseas investments by United States entities, particularly in the metals industry. Let us hope that some of the recommendations which they have made to mitigate some of the difficulties may be adopted in whole or in part. I personally have not very much confidence in them.

A LOOK AT CAPITAL FORMATION

I should like to make passing mention of certain aspects of foreign investment which I do not believe have been touched on in the Report—unless I could not find them among the welter of words. Those of us who have thought about the availability of funds for foreign investment and about the question of why it seems more difficult now to obtain private financing than it would have been in the halcyon "good old days"—although it probably wasn't even so easy then—cannot refrain from paying attention to the problem of capital formation.

One is impressed by the manifest ability of the large units engaged in the foreign and domestic petroleum industry to expand their operations rapidly and effectively, while, on the other hand, the information one has in respect of many other industries attempting to develop or expand in foreign markets indicates a search for financial assistance from government agencies and thus a lack of readily available capital from private sources.

I do not believe that the oil companies have some magic trick of management or that they are bolder than some of us engaged in the mineral fields. I do submit, although I do not have the data to offer as proof, that the answer revolves around the tax structure within which the petroleum industry operates. This, in turn, makes the taking of risks attractive in this industry, even though these risks may be located abroad.

I do not want to go into the details of the effect, in this industry, of the 27½% depletion allowance and of the privilege of deducting the intangible drilling cost, on the relationship between operating and net profit. Thus one gets back to the old economic axiom that the formation of capital results from savings, either corporate or individual; with high tax rates on corporations and on the individuals willing to take risks, it becomes increasingly difficult to find any funds for risky enterprises. The constant pressure for the payment of dividends, so that at least some take-home money trickles into the pockets of the shareholders after they in turn are taxed, the inadequate depreciation allowances condoned by the accounting profession—these make it impossible to save large enough sums for plowing back or to make the business attractive enough to engage new venture capital. When capital investments are not financed out of savings, they must be met, if they are met at all, by borrowings from governmental agencies. This is not the most desirable means of promoting expansion or conducting business in a free enterprise economy.

AN ENTICEMENT FOR LOCAL INVESTORS

But capital is becoming available for such ventures as mining. Profitable deals are made in other countries in direct competition with United States enterprises. I believe it is because the risk factor which we as United States enterprises put on foreign business is so high that it makes it attractive for local investors to move in, even though credit in those countries is expensive. Furthermore, the local income taxes are so much lower that the return from the risk is greater, and relatively rapid capital formation is possible.

I have seen several small mining groups abroad grow by the reinvestment of dividends, which of course, in those countries, are not taxed to the recipient, since the income tax has already been paid once by the corporation—with a rapidity that could not now be equaled in the United States.

Does this not lead to the conclusion that industries unprotected by the umbrella spread, say, for the oil companies, may in the future be out-distanced by companies formed locally in the newer countries where they can grow within a healthier tax climate? Should this take place, then the United States will have to meet more of its deficiencies by direct purchase from companies domiciled and operating abroad. The net effect of this will obviously be a greater export of dollars as the profits from these enterprises will not flow to United States investors.

AID WITH AN UNHEALTHY AIR

One more point reflects on the acceptance by the newer countries of the aid or stimulation of industry directly or indirectly by United

States governmental agencies. Such assistance is obviously welcomed by countries that will directly benefit in a monetary sense and are motivated by the expectation of profit. By and large, however, the emotional impact of much of this sort of activity is by no means healthy. This assistance is often afforded by our government with an air, direct or implied, of trying to buy friendship, or to improve social conditions, or in general to make oneself as obnoxious as the proverbial *nouveau riche* moving into an established community.

In summary, I think the scene will have to be changed before foreign investment can fill the gap between anticipated United States demand and the anticipated supply of raw materials.

TAXATION PROBLEM CRUCIAL

I did attempt to work up some figures of the dollars necessary for the development of mines at present prices with a productive capacity sufficient to fill the gap as estimated by the Commission. Here I ran into difficulties which I had not the time to cope with. For the copper industry, the Commission estimates that over the next 25-year period an investment of about $100 million per annum, or a total of $2.5 billion, will be necessary to fill the gap in estimated copper needs of this country. There is, of course, no way of telling how much of these funds, whatever they are, will be supplied by United States entities. But as long as well over 30% of the United States gross national income is taxed and as long as the taxes in the newer countries are at a lower level, those newer countries will forge ahead with their own national companies. I shall make no comment on whether this is good or bad from the United States point of view.

As a final comment, I can never forget that during the lifetime of those present in this room, more mineral resources have been extracted from the earth than in all previous recorded history. The rate of this extraction is expanding; the reserves of most of the mineral raw materials are increasing. The technology of finding new reserves is developing at a rate commensurate with depletion.

Given a free market—and in a free market there are, by definition, no shortages—and reasonable taxation, there would be no problem in keeping the supply of raw materials in line with demand at the price level necessary to call up the production.

We do not have an entirely free market and the chances of having a tax structure that will evoke sufficient risk-taking in foreign countries by private investors alone seems quite remote.

Discussion

QUESTIONER: I would like to direct this question to Mr. Lasky: I got the assumption—and am partially corrected—that we will be

actually faced with a shortage of minerals in 1975. Is it your opinion that we are faced with a shortage of minerals or are we faced with a shortage, for example, of $9 iron ore as compared to 39-cent copper?

MR. LASKY: If I have given the impression that we are faced with a shortage in 1975 for minerals in general, I am sorry. We always have been dependent on sources abroad for about one third of what we use, and we always will be. For another one third we have enough at home, and we can depend on having enough at home.

But there is this middle group including iron ore and copper ore on which our domestic ability to produce is dropping off, whereas our ability to consume is expanding. Our ability to produce copper at home, since you use that as an example, has leveled off in an absolute manner. Our ability to produce iron ore at home is a matter of price.

Certainly those with investments abroad are going to insist that those investments bear fruit. The net result appears to be that we will have an increasing dependence upon iron ore imports, but at the same time we will do our darnedest to produce the stuff at home at competitive prices.

MR. MASON: I think Mr. Koenig really gave the answer to this question of shortage. He says that in a free enterprise system—and I think we all hope it will continue—there is no such thing as a shortage. If there is going to be a shortage, it is going to be a shortage in a sense that it will cost more to satisfy demand than has hitherto been the case.

Whenever the Commission has dealt with a problem of prospective relationship of supplies to requirements, they have never talked in terms of physical shortages. They have always foreseen this problem as consisting of a possible increase in the real cost per unit of output of satisfying our materials requirements. That, I think, is an important fact because continued economic growth in the United States depends on an ability to satisfy requirements at continually reducing costs. That is what increased productivity means.

So this problem of shortages really reduces to a question of whether we are going to be able to meet our requirements for materials at continually falling real costs, which has been true in the past, or are we now confronted with a different kind of a situation which is going to raise unit costs more and more.

CHAIRMAN WORMSER: I think Mr. Lasky wants to add a word.

MR. LASKY: It seems dangerous to generalize in terms of raw materials as a group, since we are dealing with specific commodities.

We are faced with an absolute shortage of such things as copper, lead and zinc in the United States in terms of what the country requires. Our domestic copper industry has reached—you can get some differences of opinion—a productive ability of 750,000 to 950,000 tons a year. This is on a long-term average. Zinc will probably level off at somewhere around 675,000 or 700,000 tons as the long-term capability of the country. There was an extreme amount of discussion about lead, but no one believes we shall be able to lift our domestic production to the point where we had it in World War I, or, for example, in 1929.

QUESTIONER: I would like to address a question to Dean Mason. I wonder to what extent, if any, the thinking and the recommendations of the Commission were guided or influenced by the preamble to the Employment Act, in arriving at these estimates of growth?

MR. MASON: I don't think they were influenced in the slightest, if you are talking about the recommendations and general analysis. If you are talking about the projections, some estimate, of course, had to be made as to what would be the labor force in every year between now and 1975 and how fully that labor force could be employed. The assumption—and I say it is merely an assumption—that underlies these projections is that there will be something like a full employment of the labor force throughout this period.

QUESTIONER: May I ask one further question, then? What percentage point did you consider as being desirable in the way of employment? What was the limit of unemployment that you might have calculated these estimates on?

MR. MASON: I am going to have to refer to Professor Harberger on this. My impression was that the unemployed considered compatible with full employment was of the order of 2 million to 3 million workers out of a labor force of, say, 64 million.

MR. HARBERGER: We figured that from 2 to 3 per cent of the labor force would, in what we would call a normal full-employment economy, typically be unemployed, most of them being in what we call a transitional state of unemployment, where they are unemployed because they happen to be in a declining industry while other industries are rising. It takes them a while to get around to the places where they are going to be ultimately reemployed.

QUESTIONER: Isn't that a rather low or unrealistic figure?

MR. HARBERGER: It is not low in recent history but the guiding principle in making an assumption of full employment was

simply this: If we assumed a small enough rise in productivity, and a small enough increase in population, because we anticipated a continuous depression, we could clearly make a situation where we wouldn't have any materials problems. But we took it as our job to foresee, or try to find out, whether it was possible, or what conditions would be necessary, for the United States to continue its rapid economic growth and its rising standard of living in a high employment economy.

QUESTIONER: And inflation?

MR. HARBERGER: Inflation didn't come into our picture.

QUESTIONER: Wouldn't unemployment of 2% or 3% imply permanent inflation?

MR. HARBERGER: I don't think there is any documentation for that statement.

QUESTIONER: There is no documentation of the other.

MR. HARBERGER: I am quite sure it is possible, by an adequate monetary policy, to prevent inflation when you have 2% or 3% unemployment. I should like to point out, however, that even if we assumed 6% unemployment, our projected demand levels would be reduced by only 3%.

QUESTIONER: I would like to ask a question of the Chairman, in the light of his remark about the projection of lead needs in 1975. I would like to ask whether in your organization survey and inspection of base years—I assume you must have looked at 1950-1951—you noted any important errors underlying the Paley Report which may have stemmed from the rather successful effort (although at the time the successs may have been somewhat concealed) of industry and consumers to add to inventories of such things as copper, lead, zinc and steel, so that actual end consumption was nothing like what people at the time generally felt it was? I think we now know that actual consumption in '51, for instance, was much lower than in January, '52, it was presumed to have been. Are the correlation projections thrown out by the facts?

CHAIRMAN WORMSER: It would take longer time than we have available to give you our analysis now. You will have it next Monday.[1] You will see that we have approached our problem from an entirely different point of view, a view that we thought in the

[1]The analysis referred to was in the form of a speech to be delivered before the American Mining Congress on September 22, by Andrew Fletcher, president, St. Joseph Lead Company. The text of that talk and a Declaration of Policy on the Report of the President's Materials Policy Commission by the American Mining Congress appears on pages 48 and 51.

latter analysis was the most practical one. I might say it is, for example, analyzing our per capita consumption of lead over a great many years and coming up with a complete disagreement with what the Commission forecasts as the per capita consumption. However, time is rather short to go into that now, and you will have the details and the facts and figures revealed to you on Monday.

There is one topic Mr. Paley mentioned this morning that we might devote a moment to, because, to my mind, the Commission did not make its viewpoint quite clear enough—at least to satisfy me.

That was with reference to the tariff. I do not know from reading the Commission's report whether it recommends all these minerals and metals that are presumably going to be short to come in free of duty while manufacturers and other users have their protection, or whether they go "whole hog" and stay free trade for the entire country. I hope somebody on the Commission will enlighten me as to what the fundamental policy of the Commission is.

MR. MASON: I don't know that I can speak with great accuracy on that particular detail. Certainly, the Commission took this general line: that it felt an extension, under the reciprocal trade program, of continued reduction of tariffs on raw materials of other products worth continuing. It also felt there were a number of materials in which the situation confronting the United States was sufficiently serious to justify a unilateral reduction of tariffs.

As I remember, the Commission did not go into specific detail, material by material, and make a recommendation along that line, but there were these two elements involved: a pursuit of tariff reduction under the reciprocal trade program; and, in a special group of materials of serious concern to the United States, it was suggested that unilateral tariff reduction might also be desirable.

CHAIRMAN WORMSER: We could devote quite a time to this tariff subject, so perhaps we had better pass to another one. Another thing that puzzled me was a reference Mr. Paley made to doing away with the Buy American Act. I would like to know how you do away with the Buy American Act if you retain the Walsh-Healy Act. I did not see any mention of the Walsh-Healy Act in the Commission's analysis and I wondered whether it had been given consideration?

MR. MASON: I think it is true that no consideration was given to the Walsh-Healy Act. This does not, so far as I can see, raise any new problems. Everybody who knows anything about the situation at all knows that wage rates in the United States are much higher than they are in other areas. But, also, everybody knows who knows anything about the situation at all that those higher wage rates do not prevent the exportation of large quantities of materials to other

countries. In certain industries, our labor productivity is high enough to overcome these higher wage rates; and in other industries it is not.

I don't think the Walsh-Healy Act adds anything to that general principle. What I am trying to say is that the fact that the United States has higher wage rates does not in itself—to my mind, and I think to the mind of the Commission—justify tariff protection for American industry. There are other things that may justify tariff protection, but not that general difference.

CHAIRMAN WORMSER: My question was not directed so much at tariff protection as it was to the repeal of the Buy American Act. That was the point that I believed Commissioner Paley brought up.

Appendix I: Remarks of Andrew Fletcher, President, St. Joseph Lead Company, on the Paley Commission Report

As part of a panel discussion before the American Mining Congress, Denver, Colorado, September 22, 1952

The difficult problem with which the Paley Commission was faced is appreciated, as, in my opinion, no one can foresee, with any great competence, what our economy will actually be in 1975. If we were to go back to the year 1927, just twenty-five years ago, who could have predicted the important new industrial achievements of the United States, such as, dieselization of our railroads, the complete creation of many new industries such as television, the tremendous growth in plastics, the formation of new textile products, or the conquest of international transportation through the air? We stand on the threshold of the atomic era, which will open vistas completely undreamed of, and which may well revolutionize life for all of us.

I intend to base my comments about the Report on lead, the metal with which St. Joe is most familiar. The Commission foresees an annual lead deficit of 900,000 tons in 1975; by deficit is meant the difference between consumption and domestic mine production plus recovery from scrap. St. Joe's estimates support a "guess" of a probable 200,000-ton deficit—a reduction of 700,000 tons per year. Whether we or the Commission are even reasonably close to a correct deficit estimate would be only of academic interest to prove that different figures and assumptions give an entirely changed picture—if it were not for the fact that the Commission's forecast is subject to severe criticism. Furthermore, their 900,000-ton deficit may have frightened them into recommending the adoption of such alien control measures as multilateral government contracts, buffer stocks, quotas, etc., which if adopted, will result in the socialization of the domestic, as well as the world, mining industries.

The reason for the enormous difference of 700,000 tons per year between St. Joe's forecast and that of the Commission can be briefly summarized as follows.

CONSUMPTION

The Commission estimates that the 1975 lead consumption will be 1,950,000 tons. They have arrived at this figure by using 1950 as a base, with a projection of increased or decreased consumption of end uses over the next twenty-five years. We criticize the choosing of 1950 as a base, as this year happens to record the highest consumption

in the history of the industry. I will not analyze each particular end use, because if the base is wrong the estimate of ultimate consumption will be far from accurate.

However, I might comment on one end use; one of the important producers of tetraethyl lead has told us that they do not anticipate that the industry will increase its lead consumption by 150% and use 300,000 tons per year in 1975, as estimated by the Commission. Incidentally, this company was not consulted in the preparation of the estimate.

Lead is one of the oldest known metals, and its various properties are well established. Consequently, it is not surprising to find its per capita consumption at a fairly steady figure, year after year. To the extent that new uses are developed old ones are lost. For example, the growth in the use of tetraethyl lead is about offsetting the loss in white lead pigments, cable covering, foil, etc. The average per capita consumption for the two decades of the 1920's and 1940's—both periods of high industrial activity—is around fifteen pounds; and if one were to include the 1930's it would drop to thirteen pounds. For the last ten years it has averaged 14.7 lbs. Using this per capita consumption figure and the Commission's anticipated population of 193 million in 1975, we arrive at a projected consumption in that year of 1,420,000 tons—approximately 500,000 tons less than the Commission's figure.

There is another reason for doubting the Commission's lead consumption forecast. From 1925 to 1950 the population growth was about 36%, while lead consumption grew 33%. But, for the next twenty-five years, the Commission assumes a lead growth of 61%, although it estimates a population growth of only 27%. Therefore, using past experience as a base, the lead consumption would increase 25%, not 61% over the next twenty-five years. With a present consumption of around 1,000,000 tons, exclusive of stock piling, the 1975 consumption would approximate only 1,250,000 tons. However, I assure you that we in the lead industry are constantly striving to increase our markets, so I think a consumption of around 1,420,000 tons is probably a more reasonable forecast.

Another pertinent criticism: As an apparent justification for using the 1950 consumption of 1,212,000 tons as a base, the Commission refers to the war year of 1943, and points out that the consumption was 1,330,000 tons. However, the Commission made an error in overlooking the fact that nearly 300,000 tons of the 1,330,000 tons were stock-piled—not consumed.

PRODUCTION

I will subdivide the domestic production into primary and secondary.

(a) In 1948, at the request of the National Security Resources Board, we made an estimate of world lead production for the period up to 1970. We communicated with the major lead producers throughout the world. The estimate which was arrived at for the United States was 375,000 tons, which is 75,000 tons in excess of the 1975 Paley Commission's estimate of 300,000 tons. We anticipate no decline between 1970 and

1975, provided unrealistic governmental controls become no worse than have been experienced.

Due to lack of time, I am forced to confine my comments to the domestic situation, but it may interest you to know that our estimate for foreign production in 1970, exclusive of the Iron Curtain countries, showed an increase above 1948. Recent published discoveries, during the last four years, in Australia, Africa and Canada would justify a further upward revision. Our estimate of future foreign production is considerably in excess of that of the Paley Commission.

(b) For scrap recovery the Commission has again used 1950 as a base, but their figure is in error, as the actual recovery in that year was *482,000 tons—not 428,000 tons as stated.* In the early 1900's there was practically no production from scrap; around 250,000 tons per year in the 1920's; and 500,000 tons per year at present. The average recovery of scrap in comparison with total consumption for the last five years has been 43%; and the optimum recovery, according to the Commission's own chart, is 60%. The Bureau of Mines has shown that the reservoir of metal in use increased over a million tons during the nine-year period of 1939-1947; and, with annual consumption of roughly a million tons a year, this reservoir will certainly increase greatly by 1975. Therefore, it would seem that the 1975 scrap recovery might amount to 850,000 tons per year, which is around 60% of St. Joe's estimate of 1,420,000 tons for prospective lead consumption.

"DEFICIT"

The total of our estimated primary production of 375,000 tons plus the potential 850,000 tons from scrap is 1,225,000 tons, which, when subtracted from the consumption of 1,420,000, means that around 200,000 tons would have to be made up by imports. This figure is far less than the actual imports which have averaged 337,000 tons per year over the last twelve years. We therefore see no reason why lead consumers, or anyone, should be alarmed about the future lead supply.

A comparison of the Commission's 900,000 tons "deficit" and St. Joe's 200,000 tons, as I have shown, certainly indicates a wide difference of opinion, and raises doubt in my mind as to whether there may not also be similar great differences of opinion between the Commission and industry on other commodities.

Appendix II: A Declaration of Policy by the Western Division, American Mining Congress, on the Report of President's Materials Policy Commission

Adopted at Denver, Colorado, September 22-25, 1952

THE President's Materials Policy Commission has performed a public service in showing how free enterprise has developed American natural resources, in summarizing a vast amount of information pertinent to the mineral industries, and in emphasizing the importance of a consistent mineral policy.

We commend the Commission for:

(a) Recommending acceleration of topographic and geologic mapping of the United States and Alaska.

(b) Recognizing the principle of percentage depletion for metals and minerals.

(c) Advocating removal of the present limitations on the expensing of exploration costs applicable to minerals.

(d) Appreciating the necessity of encouraging the participation of American capital in the exploration and development of foreign mineral resources.

(e) Recommending that the well-being of small mining enterprises and prospectors be promoted.

It is difficult to reconcile the Commission's endorsement of the free enterprise system, which has created our high standard of living, with its belief "that special consideration should be given to three types of arrangement—

(a) The multilateral contract;

(b) International buffer stocks;

(c) International buffer stocks combined with limited quota arrangements"

which are part and parcel of an international plan to manipulate prices, production and exports for the assumed long-range benefit of the world. The history of domestic and international trade provides ample evidence of the failure of such well-meaning, but misguided attempts at government and private manipulation.

We strongly urge a return to free enterprise and emphatically oppose a controlled and regimented economy. We are forced to disagree with many of the Commission's recommendations, conclusions and beliefs. Particularly we believe that:

(a) Direct exploration activities by government should not be undertaken on private lands.

(b) The mining laws should not be revised to introduce a leasing system for metal miners or abolish extralateral rights.

(c) American taxpayers' funds should not be used to explore private lands in foreign countries.

(d) A Defense Materials Procurement Agency should not be established as a permanent instrumentality of the government.

(e) Successor government agencies should not be established when the present emergency agencies are dissolved.

(f) Business risks which the Export-Import Bank is unwilling to assume should not be transferred to the American taxpayer.

(g) Legislation should not be enacted to furnish government loans for foreign mineral enterprises, coupled with authorization for government to enter into management contracts.

(h) Permanent legislation should not be enacted authorizing the unilateral elimination of import duties by the Executive Branch wherever the United States is substantially dependent on imports of metals or minerals.

(i) The "Buy-American Act of 1933" should not be repealed.

RESOURCES FOR THE FUTURE

FORD FOUNDATION

Immediately following the Denver meeting of the American Mining Congress in 1952, Horace Albright proceeded to try to save the Paley report by securing the backing of the Ford Foundation to establish a tax-exempt group known as Resources for the Future to continue the program started by the President's Materials Policy Commission. The formation of this group was announced in the New York Times of November 17.

Originally, the program envisaged holding a conference in March of 1953. A conference was finally held in December of 1953, and this section includes the rapporteurs' digests of the discussions of the various sections of this conference.

There is also included the initial release announcing the formation of Resources for the Future and the program of the meeting. In addition, this section includes a commentary on the meeting which appeared in the Petroleum Press Service.

[From the New York Times, November 17, 1952]

RESOURCES PARLEY SET BY FORD FUND

TRUMAN AND EISENHOWER PLEDGE AID TO CITIZENS' MEETING IN CAPITAL ON MARCH 25–27

With pledges of support from President Truman and Gen. Dwight D. Eisenhower, President-elect, Resources for the Future, Inc., a Ford Foundation subsidiary, will hold a citizens conference on the conservation and development of the Nation's natural resources on March 25–27. The meeting will take place at the Mayflower Hotel in Washington.

The conference, the first of its scope since the 1908 conservation meeting called by President Theodore Roosevelt, was announced yesterday by Horace M. Albright, president of the organization and former director of the National Park Service.

"General Eisenhower," Mr. Albright said, "has written that he will ask the cooperation of all governmental and private agencies concerned.

"It is high time that the conservation conference of 1908 should be reborn in a midcentury setting," the President-elect declared.

In a letter to Mr. Albright, President Truman suggested that reports of the Paley Materials Commission and the Water Resources Policy Commission would make a major contribution to the future welfare of the country by providing guides for the wise use of our valuable resources.

UNITED STATES NOW A DEFICIT NATION

"The report on materials policy," Mr. Albright said, "points out that with less than 10 percent of the free world's population and 8 percent of its land area, the United States consumes half the free world volume of materials; that we have completed the transition from a raw materials surplus nation to a raw materials deficit nation and from a net exporter to a net importer of many of our vital materials.

"We have been 'mining out' our renewable resources—soil, forests, and underground water—and restoration, where possible at all, is slow and costly."

Resources for the Future, Inc., a nonprofit corporation established to serve the Ford Foundation as an advisory group on resources, will undertake "long-range programs of research and education to assure the resources essential to the progress, vigor and security of the Nation," Mr. Albright explained.

The directors of the organization, in addition to Mr. Albright, who is president of the United States Potash Co., Inc., are:

Edward J. Condon, vice president of Sears, Roebuck & Co.

Dr. Reuben G. Gustavson, chancellor of the University of Nebraska and former member of the board of governors of the Argonne National Laboratory for Atomic Energy.

E. B. MacNaughton, former president of Reed College, Portland, Oreg.

Leslie A. Miller, former Governor of Wyoming and former chairman of the Resources Task Force of the Hoover Commission.

William S. Paley, chairman of the Columbia Broadcasting System and of the President's Materials Policy Commission.

Fairfield Osborn, president of the Conservation Foundation.

Beardsley Ruml, former adviser to the National Resources Planning Board.

Stanley Ruttenberg, director of education and research of the Congress of Industrial Organizations.

M. L. Wilson, director of the United States Extension Service, Department of Agriculture.

Charles W. Eliot, planning consultant and former director of the National Resources Planning Board.

MIDCENTURY CONFERENCE ON RESOURCES FOR THE FUTURE

(Subject to further comment by this section's participants)

Section I chairman, Charles C. Colby; cochairman, Harry R. Wellman; James C. Rettie, rapporteur. December 4, 1953.

COMPETING DEMANDS FOR USE OF LAND (REVISED SECTION DIGEST)

SUBSECTION A—URBAN LAND

The importance of urban lands lies not in their extent but in their value as evidenced by the great concentrations of activity, investments, and people on them—the total urban resource. Urban and nonfarm residential and industrial lands (relatively insignificant in terms of the Nation's acreage), possess over five-sixths of the value of all lands, contribute seven times more in taxes than do rural lands, and provide residence for about 70 percent of the Nation's population.

Land cannot be intelligently considered apart from people, their activities and institutions, and their created resources. Consideration of the competition or allocation of uses for urban land inevitably leads to consideration of the complex interrelationships of urban living and work. Yet our important urban resources have never received the searching attention, analysis, and research that has been accorded to rural lands and resources.

Our urban resources are threatened in many ways. Their significance and use-intensity make them attractive and vulnerable to atomic attack. Although a maximum reduction of urban vulnerability seems beyond present capability and feasibility, some measures within economic reason can be applied to meet social needs at the same time. These measures include the reduction of densities, establishment of open spaces and firebreaks, and guidance of urban expansion.

Central traffic congestion, spreading of depreciated areas, atmospheric pollution, disrupting invasion of the middle-aged residential areas, inadequate reservation of land for industry, and haphazard development in the outskirts are some of the major problems needing understanding and attention. These problems call for more effective means of planning and executing the redevelopment of outworn parts of our cities, revitalization of the central areas, conservation of the great bulk of urban areas, and guidance of new growth.

Attention was given to a series of 10 specific issues which are broadly representative of competing demands for urban land. In each case, the general nature of the problem was reviewed. Discussion disclosed certain areas of general agreement, certain areas of general disagreement, and certain questions which should be answered before policies are determined and action is taken. A summary of subsection opinion on these matters follows:

Centralization versus decentralization.—There was general agreement that: (*a*) Some form of decentralization or dispersal is going on in most large urban centers, (*b*) high degree of decentralization would make the bombing of the United States far less attractive to an enemy power, (*c*) effective dispersal should be considered in terms of employment, housing at reasonable cost, suburban

amenities, efficient transportation, and effective government, (*d*) the rate of urban decentralization will be slow.

Matters on which there was general disagreement include: (*a*) The general social and economic desirability of large-scale urban decentralization, and (*b*) the extent to which defense will compel early action to achieve a high degree of dispersal.

Questions suggested for intensive study include: (*a*) How much decentralization would be required to make the bombing of the United States unattractive? (*b*) is it economically feasible to consider such a degree of dispersal? (*c*) is what appears to be a trend toward decentralization less the moving out of established functions and facilities, and more the establishment of new functions and facilities in the outlying areas? (*d*) what are the economic and social advantages of large urban centers? (*e*) could these advantages be equaled or exceeded by an equivalent population living in a series of well-planned, relatively small (100,000 or less in size) urban centers each separated from the other by some miles of permanently nonurbanized land? (*f*) to what extent can the taxing power and the zoning power be used to encourage dispersal and spacious urban development? (*g*) what are the accessibility requirements of various major types of urban land uses and functions? (*h*) what are the basic forces tending toward centralization and dispersal? (*i*) how can "middle-aged" urban areas be saved from deterioration and blight?

Open spaces versus development.—It was generally agreed that: (*a*) Not all urban land can be "developed"—adequate open space for public recreation, public buildings, freeways, airports, flood channels, etc., are essential, (*b*) urban areas generally do not have enough space for public recreation, (*c*) the pattern of public recreation areas is as important as the quantity of land devoted to this purpose, (*d*) public open space, especially recreation areas, should not be regarded as "free sites" for various proposed developments, (*e*) suitable public recreation areas add more to property values than the cost of such area, (*f*) there is a special need to reserve appropriate sections of waterfront for free public access and recreational use.

There was one area of general disagreement. It pertained to the question of the amount of land within the urban community that should be made available for recreation. No rule-of-thumb standard could be agreed upon.

Questions proposed for study include: (*a*) How can sufficient land be provided for nonurban areas (recreation, greenbelts, agriculture, etc.) to permit the proper growth of decentralized communities? (*b*) What are socially desirable, economically feasible standards for public open spaces?

Depreciated areas versus urban redevelopment.—It was generally agreed that: (*a*) improvements on urban land depreciate, (*b*) modern society cannot afford slums, (*c*) depreciation can be retarded and perhaps halted by the effective cooperation of all public agencies and private interests concerned, (*d*) the present urban redevelopment program should be improved to give better balance to housing, business and industrial uses, (*e*) private initiative should be favored in urban redevelopment to the extent that it can and will solve the problem.

Questions proposed for further study include: (*a*) Have functional changes in certain city areas contributed toward depreciation? (*b*) What balance of residential and industrial improvements are necessary for an adequate community tax base? (*c*) What is the relative cost of comparable improvements in a redevelopment area and in a new, outlying area? (*d*) Should large core cities be encouraged under title I to acquire blighted central areas and to use the land for such purposes as recreation and parking lots?

Industry versus homes.—It was generally agreed that: (*a*) Residential uses should not be permitted in areas zoned for industry, provided the zoning is based on careful study of anticipated requirements and the land is actually suitable to industry, (*b*) performance standards for industry should be substituted for obsolete industrial zoning classifications, (*c*) the planned or organized industrial district, because of its efficiency and compatibility with nearby residential use, should be encouraged where appropriate.

Matters proposed for study include: (*a*) Improved techniques for estimating industrial land requirements and (*b*) land requirements of various types of industry by size.

Urban uses versus rural uses.—It was agreed that: (a) Our expanding urban centers cause serious conflicts between urban and rural uses of land in "fringe areas," and (*b*) important acreages of excellent farmland have been removed from production by subdivision, sometimes premature subdivision.

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There was disagreement on the seriousness of the loss of farmland to urban development in view of the small areas so lost as compared with the total area available for farming.

Questions proposed for study include: (*a*) Can the increased tax burden on farmland in "fringe areas" be equalized? (*b*) Can good urban development bypass farm areas devoted to specialty crops?

Airports versus other urban uses.—It was agreed that: (*a*) commercial airports should be close to the center of population, (*b*) military airports should be located away from major urban areas, (*c*) rapid transit between the commercial airport and the city it serves is essential, (*d*) both land purchase and zoning are needed to control land in the vicinity of a major airport, (*e*) the advent of jets with their added noise increases the seriousness of the airport problem, (*f*) helicopter shuttle service may provide convenient access to outlying airports.

"Blight" uses versus other uses.—There was general agreement that: (*a*) junkyards, auto wrecking yards and other "blight" uses are essential elements of modern society, (*b*) some such uses are highly profitable to their owners, (*c*) the modern sanitary fill system is preferable to dumps for refuse disposal, (*d*) urban planning should specifically provide areas in which "blight" uses can operate with minimum harm to neighboring development.

Ribbon business versus normal highway frontage use.—It was agreed that: (*a*) ribbon business on shallow lots along major highways is not functional, (*b*) there is far more such frontage than there is demand for such business property, (*c*) successful new shopping centers are on large enough tracts to provide parking space 3 to 4 times the floor area of stores, (*d*) highway frontage not reasonably needed for business or industry may be used for normal community purposes, including housing.

One question was proposed for study—what is the best use of the thousands of shallow vacant lots fronting on busy traffic streets?

Rapid transit versus private cars.—There was general agreement that: (*a*) Rapid transit is public transit which delivers a passenger to his destination faster than he could get there driving alone in an automobile, (*b*) rapid transit should carry a majority of people going to and from the downtown center, (*c*) freeways and ample downtown parking facilities are needed to handle cars which properly must come downtown, (*d*) freeways and rapid transit both by rail and bus can be combined effectively.

Disorganized growth versus orderly development.—It was agreed that: (*a*) A competent planning program could resolve many urban land problems, (*b*) such a program can operate in most metropolitan areas only through active cooperation with multiple units of government, (*c*) regional government would facilitate orderly regional development, but such action does not depend on regional government. It was agreed that far too little basic information is available for sound urban planning, and that much research in this field is necessary.

The need for objective, basic research was highlighted throughout, and the group was of the unanimous opinion that adequate funds should be provided for such research.

SUBSECTION B—RURAL LAND

Discussion of competing demands for agricultural land revolved about the economic use of land in farm units. On the one hand, 40 percent of our farm people produce about 90 percent of the Nation's agricultural products. On the other hand, about 30 percent of our farm people live on low-production commercial farms that produce a relatively small part of the Nation's food and fiber.

The idea was put forth that successful farming requires a proper balance of land, labor, and capital. As a whole, our agriculture is in excellent balance. Capital is used as it should be, and human labor earns as much as in any other parts of the economy.

But on 1½ million small farms, scattered throughout the South and in areas like New England and the intermountain West, a real lack of balance is found among these three economic factors. Farm families struggle along spending too much labor on too little, and sometimes unproductive, land, with too little capital to provide for machinery, fertilizer, etc.

Some examples were presented showing that with a proper supply of capital these low-production farms could be made to produce higher incomes. In some cases the availability of credit made possible remarkable improvement. The

idea was expressed that farm woodlands often provide an important source of income for low-production farms.

There seemed to be general agreement that the low-production farm and the part-time farm do not significantly affect the crop-surplus problem. To correct the lack of economic balance on low-production farms, it was generally agreed that the efforts should be through education, public information, and credit.

Surpluses of agricultural products brought forth considerable discussion. One view expressed was that the present crop surplus is the result of a temporary condition brought about by the tremendous increase in demand created by World War II. Another idea was advanced that unless conditions change markedly, the problem of surpluses may be with us for years to come.

To correct this condition and bring crop production closer to equilibrium, the adoption of price supports at a somewhat lower level was proposed, along with a vigorous program to help farmers make the necessary adjustments. Specific measures suggested include the lengthening of rotation in the Corn Belt and Eastern Plains, with more emphasis on the production of hay and forage; increasing summer fallow in the high plains wheat areas; returning some wheat land to gress; and encouraging greater diversification on the cotton farms of the South.

Another viewpoint was that any acreage-adjustment program should not require the same reductions for good lands as for poor lands, but rather should be designed to take the poor land out of cultivation. However, it was recognized that many serious difficulties stand in the way of such a policy.

In opposition to the idea of reducing the surpluses was a viewpoint expressed several times that it does not seem quite right, somehow, to curtail agricultural production at a time when some people in the United States and other parts of the world want food. This was recognized as no simple problem: It was conceded that we cannot go on indefinitely giving away our farm produce; the hope was expressed that some international program may be developed to bring about a better distribution of the world's food and fiber resources.

About conflicting demands for commercial forest land, the view seems to be that local conditions determine how much land is acquired by industrial concerns. This apparently is a practical problem of individual plans and preferences and capital available for investment in raw-material reserves. The main deterrent in some cases seems to be the nonavailability of suitable land.

One speaker mentioned public opposition to large-scale acquisition of land by pulp companies in the South, and a question was raised about the willingness of industry to acquire lands that are poorly stocked. It was pointed out that this has been done in some places. There seemed to be general agreement that no special encouragement for industrial acquisition of commercial forest land is needed. The viewpoint was expressed that owners of small forest properties can produce a large part of the pulpwood needed, and that they should be encouraged to do so.

It was recognized that roads and power transmission and pipelines take substantial areas of forest land completely out of production, and there is need of correlating conflicting demands to minimize the area required.

National-forest policy was discussed at some length. The consensus was that overmature and mature timber is not being harvested as rapidly as it should be. The main reason for this seemed to be the lack of the necessary access roads. It was explained that national-forest timber sales are usually too small to justify the investment that a private operator would have to make. It was also pointed out that timber must be made available to the small operator as well as the large operator, and that roads in the national forests must generally be public roads. One new approach to the problem was noted: A farmer cooperative organized to harvest timber on one national forest. A question was raised about the feasibility of financing access roads by means of tolls or some other self-liquidating arrangement. Overmature and mature timber should be harvested, but more access roads are needed to do the job, and that need remains to be filled.

The problems of burning and grazing of forest lands came in for some attention. These problems vary greatly from region to region, it was agreed. In some ways fire can be used as a land-management tool. In the South a decline in the indiscriminate use of burning was reported; this was attributed to a remarkable change of attitude brought about by education.

It was pointed out that the western range lands are actually shrinking in size because of the invasion by brush and noxious weeds, primarily as a result of

overgrazing. Control efforts are being made, but the task of reconverting range lands to grass will not be easy.

Discussion of land for recreation centered around the condition and use of the national parks and those parts of the national forests that are used for recreational purposes. Because of the trend toward higher family income and more leisure time, a great increase in recreational use of these areas was predicted for the future. The generally accepted viewpoint was that recreational facilities in the national parks are not keeping pace with demand. No one seemed to feel that any large additions should be made to the area now in national parks, but rather that greater efforts should be made by the Congress to provide for the existing areas. Several persons advocated that the problem of providing additional areas and facilities for recreation should be left to the States and to local agencies. Recreation also provides wide opportunities for private enterprise.

A conflict was sensed in the use of wet lands. It was shown that many wetland areas formerly used by waterfowl are being drained to permit their use for agricultural crops, even in the face of present surpluses. Several speakers felt that it would be more in the public interest to reserve these areas for waterfowl habitat. Others expressed the view that eventually these areas will be needed for food production, and in the long run it may be desirable to convert these lands to agricultural use. Proponents of their use for waterfowl habitat suggested that these wet lands could be kept in their present use, in wet storage so to speak, until they are needed for producing crops. This is clearly one of the unsolved conflicts in the conflicting demands for use of land.

The construction of water reservoirs introduced another problem of competing demands for land. It was suggested that in planning such works, a thorough analysis be made of all the factors involved. These involve the multiple uses of the reservoir area, and the impact on the local economy. It was noted that many mistakes have been made in the past because attention was not given to such details. It was further suggested that reservoirs often take some of the most highly productive land out of cultivation, and that before any such project be undertaken, a thorough analysis of the net cost should be made.

As long as the Federal Government bears the major part of the cost of flood-control projects, downstream communities will be tempted to shift the costs of flood-plain use to the general public. Some of the pressure for such projects could be reduced by requiring that beneficiaries bear a larger share of the costs.

Rural zoning has been used to attain a variety of ends: to promote the rehabilitation of cutover forest areas, to guide community growth on the urban fringe, to protect farm communities from disrupting activities, to protect highways from economic suffocation, and more recently to preserve the better agricultural lands for farming.

The interest in the discussion seemed to center around the zoning of highway areas. It was shown that often, after a modern highway was constructed, and if zoning were not imposed, many installations and activities quickly sprang up that were not compatible with sound highway management. The idea was generally accepted that zoning regulations should be handled by local agencies rather than by State Governments. Some, however, declared that their experience indicated that local pressure prevented zoning when it actually seemed highly beneficial for the community. In such instances, State action may need to be invoked.

A discussion of the survey classification and mapping of land resources brought forth a thought that rather complete coverage of all our land resources would be highly desirable. For extensive uses such as forestry, a rather general survey seemed appropriate, while for intensively used areas a thorough land survey should be undertaken with complete detail of all factors that are involved in such use.

The obvious lack of adequate criteria for measuring the values of the service uses of land was implicit in numerous discussions. It was the general opinion that there is great need for basic research to develop better tools for such analysis.

MID-CENTURY CONFERENCE ON RESOURCES FOR THE FUTURE

(Subject to further comment by this section's participants)

Section II: Chairman, Lloyd E. Partain; cochairman, Samuel T. Dana; Richard L. Kenyon, rapporteur. December 4, 1953.

UTILIZATION AND DEVELOPMENT OF LAND RESOURCES (REVISED SECTION DIGEST)

Conference sessions of the subsections of the section on Utilization of Land Resources of the Mid-Century Conference on Resources for the Future resulted in broader understanding of problems and significant progress in work to be done for their solution.

Areas of disagreement in the end were so narrow that it can be properly said that the records of this conference can serve and serve well as guideposts to future policies in dealing with our Nation's renewable natural resources.

SUBSECTION A—FOOD AND NONWOOD FIBERS

Chairman, Murray R. Benedict; Walter B. Garver, rapporteur; Raymond P. Christiensen, rapporteur.

It appears likely that the need for food and nonwood fibers from United States sources will increase by 40 to 50 percent between 1950 and 1975. The subsection agreed in general that an expansion in farm output sufficient to meet this need can be achieved. It was also agreed, however, that such an expansion will not just happen. It will require more vigorous efforts of a number of kinds than those of the past.

The expansion which will be needed during the next 25 years is about as great as that which was achieved in the last 25 years. Several factors which were then very favorable to expansion in farm output apparently will be less significant than in the recent past. For example, the shift from draft animals to tractors and trucks as sources of farm power released for food and fiber production about 70 million acres of land, the equivalent of nearly one-fifth of our total cropland area. Also, in recent years, we were apparently putting into use the accumulated fund of knowledge based on fundamental research at a faster rate than we were building it up. In addition, the response from a further stepping up of applications of fertilizer and lime and from improved practices may be somewhat less per unit of input than in the recent past.

In short, the subsection regarded the attainment of national objectives in the realm of food and fiber production over the next 25 years as possible and probable but did not subscribe fully to the very optimistic forecast presented at the opening session of the conference.

The major problem in meeting future requirements for farm products is that of obtaining additional output efficiently and at low costs so we can continue to improve levels of consumption and promote economic progress. Land improvement and development as well as higher levels of output per acre and per animal unit will be needed. It seems probable that 40 to 45 million acres will be added to the present cropland area—15 million by reduction in numbers of draft animals and 25 million by land development. The amount added by development of additional land will, of course, depend on economic conditions and need. The anticipated increase in cropland area for food production could account for 5 to 10 percent of the additional farm production needed. More land could be developed but it would be costly. The further 35 to 40 percent increase in farm production will have to come mainly from higher levels of output per acre and per animal unit. We will need more production per acre from pasture and range lands as well as from cropland.

The needed expansion in farm output will require expanded programs of research both in fundamental and applied sciences, especially in those kinds of fundamental long-time research where we have been drawing heavily on our accumulated fund of knowledge. More effort to bring about the adoption of improved techniques will also be needed.

Expansions of farm output of the size required, at costs to farmers and to consumers that do not increase in relation to costs of other products and services, can be achieved provided research, education, and conservation are adequately supported and the necessary incentives are provided. But higher levels of output per acre, per animal unit, and per worker in agriculture will, as in the past, require increased use of fertilizer, machinery, fuel, and other materials from other segments of the national economy.

There was substantial agreement that we are not supplying enough engineering and technical aid with respect to soil and water conservation and that the methods of supplying such aid could be improved. For example, not enough attention is being given to the loss of organic content of the soil or to the need for more work on trace elements. The losses from erosion still do not receive the attention they require.

One speaker stated that neither the regional organization of soil conservation activities used in the past, nor the breaking down of the technical work to State and local levels meets the needs for engineering and technical aid because neither type of organization is well suited to handling the kinds of problems that relate to watersheds as a whole.

On the matter of soil-conservation payments, various views were expressed. Several speakers expressed the opinion that the payment programs have stimulated land-operator interest in conservation and have induced farmers to make improvements they would not otherwise have made. Some members of the subsection stated that such payments are not needed or desirable in their areas. The more general attitude was apparently that some financial aid as well as technical assistance is needed in some areas and for some types of farmers. However, several participants expressed the view that there is need for more selective and discriminating use of soil-conservation payments than in the past in order that public funds may be used with maximum effectiveness in achieving the results desired.

There was a general impression that we do not now know enough about how to control erosion, or about the significance of the losses now being incurred. We have not as yet reduced sufficiently the losses from erosion and should push forward vigorously in this realm both through research and action programs.

The majority view was that we are not using fertilizer to the extent needed for profitable farming, nor to the extent socially desirable. We still are removing nutritive elements from the soil at a rate far in excess of the replacement rate. However, in some areas fertility has been built up to levels far above those originally contained when the land was first brought into use.

In the dicussion of problems relating to open-range lands there was unexpectedly general agreement that for most of the range lands now in public ownership the continuance of this arrangement will be the one most conducive to the upbuilding and protection of this resource.

Several of the participants urged that all Federal activities relating to Federal lands not in specialized use be placed in a single agency so that policies and administrative arrangements relating to them may be more uniform, overhead organization reduced and simplified, and better service provided to the public. On the whole, the views of livestock growers and of the Federal administrators in charge of these lands appear to be much more nearly in accord than they were a few years ago.

The Federal programs have helped to raise the productivity of range lands by demonstrating the beneficial effects of reseeding, clearing, and other practices and by making these practices financially attractive. The productivity of range lands apparently has been markedly increased in some areas. In others there has not been satisfactory progress.

The potentialities for improvement of range lands through application of present knowledge are great. But research is needed to determine the economic significance of various types of range improvement and especially for the purpose of developing improved varieties of grasses.

Little attention has been given to optimum combination of uses for land. We are just beginning to come to grips with this problem. Much more work on the classification of these lands, to show capabilities under different uses, will be needed before much progress can be made in establishing desirable long-term uses of them.

It is generally agreed that not enough research of a long-term nature is being conducted on land-use problems as well as generally in the agricultural sciences. Too much emphasis is being placed on immediate research findings with the result that we are not utilizing research efforts most effectively over the long run. This is something that research foundations might well look into.

The water-surfaced lands, as a source of food and furs (through intensive culture of fish, domestic waterfowl, and fur-bearing animals), have limited, though increasing, economic significance in the United States. Nevertheless the importance of this asset is much greater than is generally realized.

There are 30 million acres of such lands, excluding the Great Lakes and the estuaries along the Atlantic and Pacific coasts. Some 2 million acres of this area consists of farm ponds.

The greatest value of inland waters today and in the future is for recreation though their food-producing possibilities are not negligible and could be increased if there should be sufficient need for the kinds of food they produce. Until there is greater pressure on United States food resources, we need not expand greatly our efforts to produce food in this manner but this resource should

be conserved and developed both as a recreational asset and as a source of food and furs. Our marshlands in America are being used as a breeding and growing ground for fur-bearing animals, particularly muskrats. This has developed into a $50 million industry. In some areas, the amount of food produced is significant and increasing, even though recreational use continues to be the one of greatest importance.

SUBSECTION B—TIMBER AND WOOD PRODUCTS

Lowell Besley, rapporteur; James B. Craig, rapporteur; chairman, Benton R. Cancell.

Timber and wood products development is moving ahead at a phenomenal rate. During the past decade the favorable economic climate has combined with the necessity of converting to a second-growth forest economy to bring about conspicuous advances in forest management practices, utilization techniques, and marketing of forest products. This revolutionary progress was reflected throughout in the lively and informative discussions that marked the consideration of the several questions before subsection II–B.

In the deliberations of the subsection, consideration was given to the series of eight questions, propounded by the steering committee of section II as representing some of the most difficult problems pertaining to the utilization and development of timber and wood products. The following paragraphs represent a condensation of the ensuing discussion, dealing primarily with the various areas of agreement and disagreement of the various points under consideration.

Although recognizing that we are still far short of the ultimate goals of educational and other assistance programs designed to improve the practice of forestry on farm woodlots and other forest small ownerships, there was general agreement that significant progress has been made since World War II, especially in those areas in which adequate market outlets exist. General confidence was expressed that acceleration of appropriate educational and assistance programs will extend improved forest practices to the point that the small woodland areas will carry increasing weight in helping to meet future timber requirements. There is also agreement that the Federal Government, the States, and private owners all have an important stake in bringing about the needed improvements in practice, and that cooperative action is necessary in achieving the desired result. The principal areas of disagreement on this subject pertained to the respective responsibilities of each cooperator, and the extent to which services other than educational measures should be furnished free.

Research in forest fire prevention and control, in insect and disease control, in reforestation and in forest management was generally conceded to be a Federal responsibility, although not exclusively so.

The present principle of Federal, State, and private cooperation in fire control is generally acceptable, although there was some disagreement as to the relative contribution each of the cooperators should make. However, it was conceded that the trend toward a relatively greater State contribution should continue or be accelerated. More intensive fire protection, above a reasonably basic standard, should be at the expense of the landowner.

With respect to the relative responsibilities of Federal, State, and private agencies in obtaining more effective control of insects and disease, it was proposed that the same pattern of cooperation between these three groups, which has been so successful in forest fire control, be followed also in pest control. The Council of State Governments has prepared a model pest control law which has already been adopted in some States. Pest control would be largely a State and local matter, with Federal grants-in-aid and inspections as now applied to fire control, and State and local pest action councils can be of great assistance. It was further proposed that basic research in forest insects and disease would be best carried out as a Federal activity.

Two viewpoints were expressed with regard to the production of tree seedlings. One held that Federal grants-in-aid to State forestry departments for seedling production had been a helpful incentive in the past but felt that State nurseries were now well established and should be self-supporting. The other viewpoint held that the aid is still needed—at least in some sections of the country—and should be continued at least until all State nurseries were in reality self-supporting. As a group, the Association of State Foresters expressed the conviction that Federal grants-in-aid for reforestation should be continued.

The greatest area of disagreement concerned Federal grants-in-aid for forest management. The consensus appeared to favor Federal research and financial assistance to the States with the States taking the primary responsibility in

education and demonstration. It was stressed that industry should take an increasing responsibility in educating and assisting landowners from whom its raw materials are obtained. Some participants felt that the State should provide free technical services to the landowner; others considered that a charge should be made; while still others maintained that these services should be furnished by industrial foresters and consulting foresters and the State should keep out of direct service entirely.

In these discussions relatively little sentiment was expressed for Federal regulation of cutting practices. One group felt that State regulation, cooperatively developed at the local level, could contribute materially to achieving a balance between growth and drain. Another group felt that regulatory laws would be premature and that the objectives should be attained through increased education efforts. It was pointed out that the trend in State laws is away from fixed minimum practices established by statute and toward a flexible system, leaving the responsibility for rules in the hands of local committees or boards composed largely of forest landowners. Throughout this discussion there appeared to be general agreement that education was the primary need, whether assisted by a regulatory law or not.

There was substantial agreement that the present pattern of forest land ownership be studied for the purpose of determining what adjustments, if any, should be made, and that the Higgins Lake proposal that this study be made by a joint congressional committee of Congress (made up from the regular committees on Agriculture and Interior) and by a committee appointed in each State by the Governor, be followed. Such a study would not be expected to result in either wholesale acquisition or sale of public lands, but would look toward adjustments which would enable both public and private owners and managers of forest lands to make those lands fully productive in the public interest. Continuity and efficiency of management would be important factors studied. Sentiment was expressed for maintaining the integrity of the basic structure of the national forests.

There appeared to be general agreement on the measures which should be taken to obtain prompt and full utilization on a sustained-yield basis of the forest resources in national forests. The four major suggestions were (1) building timber access roads, (2) simplifying timber sale procedure, (3) speeding up timber inventories, and (4) doing more advanced engineering and timber management planning. The most critical need, fully emphasized by everyone, was for an adequate transportation system for the national forests.

The question of relative emphasis on protection, biology (including genetics), silviculture and management, economics and utilization in the expenditures for research; the relative source of funds as between Federal, State, and private interests; and the character of the research to be conducted by each group brought out few differences of opinion and no serious disagreement. It was stated that the funds expended on forest research should be doubled within the next 5 years. While research in certain fields, such as product development, silviculture, and protection against fire, was producing effective results, that in certain other fields was being seriously neglected. Among these neglected areas were listed insects and disease, watershed management, forest genetics, utilization of low-quality woods, and economic aspects of forest management. Lack of correlation in the overall research program was mentioned and a recent survey indicates that some individuals and institutions are spreading themselves too thinly over a wide range of research projects instead of concentrating on a few more valuable fields. The survey of research currently being conducted by the Society of American Foresters should contribute to better correlation. The need for research in forest genetics was emphasized again and again, particularly in view of the extensive current reforestation programs. A very considerable increase in basic research was strongly advocated and the value of research to industry, private landowners, and Government alike was stressed.

It was generally suggested that industrial organizations concentrate their efforts primarily on applied research and provide more of the necessary pilot-plant developments from promising fundamental research leads and that the Federal Government and educational and research institutions undertake the bulk of the basic research. Nevertheless it was pointed out that about 88 percent of current Federal research expenditures are in applied research and, contrarily, a recent survey indicates that there has been a tremendous increase in fundamental research on the part of industry, particularly in the pulp and paper field. It was indicated that the forestry schools are in an excellent position to carry on fundamental research with financial help from industry, and that the agricul-

tural experiment stations also have a wonderful opportunity to carry on work in this field. A deterrent to the latter organizations has been the lack of understanding and sympathy for forest research on the part of State agricultural experiment station directors, who need to be educated in this field.

There was general agreement that the current type of periodic timber resource review was desirable as a basis for the formulation by private and public agencies of forestry policies for the Nation. There was some objection to the inclusion of predictions along with figures based on factual field surveys, but the concensus was that this type of review would be very useful for the intended purpose.

While statistical projections of future consumption may be misleading and subject to individual interpretation, one thing is certain—the national needs for forest products will continue to increase materially over the next 25 years, and probably at an accelerated rate. Moreover, watershed protection and recreational values have become increasingly important to the Nation's welfare and must be regarded as an integral part of the forest-development program. On these points there can be no disagreement.

While subsection B was assigned the subject of utilization and development of land for timber and wood products only, the multiple-use concept was kept constantly in mind.

To summarize, there is no question but that important conflicts exist, even among professional foresters and students of conservation, regarding the means of reaching our goal of giving the forests their proper place in an economy of abundance. While the area of disagreement has been steadily narrowing over the years, certain of these conflicts will always exist for they lies deeply rooted in sincere differences of philosophical thought which are part and parcel of the American way of life.

SUBSECTION C—WILDLIFE, SCENIC, WILDERNESS, AND OTHER RECREATIONAL AREAS

Edward H. Graham, Rapporteur; Sidney S. Kennedy, Rapporteur; chairman, Paul A. Herbert.

The primary points of discussion relative to the wildlife resource were the increasing demand for wildlife by the hunter and fisherman, and the problems arising from this demand. There was general agreement that the demand is increasing constantly, as attested to by the sharp increase in the number of hunting and fishing licenses and duck stamps sold each year. Furthermore, the conferees were in agreement that because of the forcasted increase in population and in leisure time, that the demand on this resource would continue to mount.

In the face of this rising demand, the supply has decreased by the destruction of suitable habitat for the production of game and fish as other land and water uses have increased. While this condition is quite general, it was agreed that it was most acute in reference to the water-fowl resource, because of the widespread drainage and reclamation of habitat suitable to this form of wildlife.

The solution of the problem brought many suggestions from the members of the subsection. As might be expected, disagreement developed as to the efficacy of some of the methods proposed. However, there seemed to be general agreement that in the management of fish and wildlife there is need for more attention to human considerations, such as to the carrying capacity of the land to support hunters as well as game and the necessity of influencing sportsmen to find satisfaction through the utilization of such supplies as are available. It was also generally agreed that we must achieve a more adequate understanding of wildlife facts and that much additional research should be undertaken to fill the many gaps in our knowledge of this resource and its manipulation.

There also seemed to be general agreement that the conservation of wildlife habitat, and specifically waterfowl habitat, to other uses has often been ill advised and unnecessary. A fuller understanding of water values for fishing, waterfowl production, and other recreation is necessary in order to compare these values with the use of the water resource for domestic, agricultural, and industrial purposes. This would involve also, a reconsideration of criteria needed to designate water values and water rights in terms of modern needs and usage. It was pointed out, and no disagreement voiced, that it was imperative to sustain the supply of wildlife regardless of the sport of hunting and fishing, to meet the aesthetic demands and to maintain the natural balance, both important to a much larger segment of the people.

While it was generally agreed that habitat improvement by private landowners was necessary to maintain or increase the supply, there was a difference of opinion as to whether the incentive to carry on such work would be in-

creased sufficiently to justify reimbursement to the landowner as long as the game is public property. Difference of opinion also seemed apparent in the amount and character of public activities that could be expected to improve the fish and game supply although it was clear that further acquisition of public game lands seemed desirable.

In the discussions on the management of scenic resources and in the protection of wilderness areas there was little difference of opinion voiced except on details of implementation.

In the discussion of parks, it was pointed out that the use of national parks, monuments, historical and wilderness areas is constantly increasing. The number of such areas and facilities, services and accommodations are inadequate to meet present needs and to properly portray in broad outlines the pageant of America's great natural and historical sites. In Japan about 4 percent of the country is in national parks. So additional national parks and monuments are needed in long-range program—especially in the East. However, some areas that are not of national significance should be eliminated.

The opening of some additional sections of existing parks and monuments by roads and trails will be necessary, especially in the newer parks. However, no road construction in the wilderness areas of the older parks is desirable. It is hoped that further needs may be met by more efficient use of existing developed areas, by increasing facilities on outlying sites, and outside the parks, and by more adequate interpretive programs. Additional lodging and restaurant accommodations are required in the parks, as well as on the outside. Most of our present facilities were planned or constructed for anticipated use prior to World War II.

The subsection agreed that the resources in national parks and monuments and wilderness areas are not locked up or wasted since they contribute to the welfare of tens of millions of persons, and serve as a catalyst to support many business enterprises. It was pointed out, too, that in the future fishing may have to be eliminated or restricted in some national parks.

It is essential that we maintain the high quality of our parks and other related types of areas. Some resources are so fragile that they need special attention and protection. Examples cited are the fragile formations in caves and around geyser basins, rookeries of rare birds, and historic and prehistoric structures.

About 1 percent of United States lands is in wilderness areas. We must provide more rather than less protection, do more leisurely planning, give greater stability through congressional recognition in other types of wilderness areas besides the national parks, eliminate inholdings, and correct abuses of the mining laws.

The conferees consider that the major threats to wilderness areas are lumbering, grazing, and mining. Others are reluctance of planners to consider alternative sites for reservoirs, interior private holdings, proposals to turn Federal lands over to the States, motorized transportation, tendency to have excessive conveniences and facilities, increasing numbers of visitors, and delay in setting up long-range programs. It was suggested also that the shortage of lumber should not be considered a valid excuse for cutting on a wilderness area.

However, minority opinion was expressed that it is difficult to generalize on wilderness areas because of varying conditions. For example, in managing resources to provide the maximum benefits over a period of years, the Ponderosa pine in the Gila wilderness area in New Mexico should be managed by the Forest Service to provide continuous employment for a sizable community. On the other hand, it was also pointed out that at the time of the hearings in New Mexico, the advocates of the wilderness area were adamant for maintaining present conditions and local communities felt that the area had greater cash value as a wilderness than as a managed forest area.

The national parks and monuments and wilderness areas are only one aspect of a comprehensive park conservation program. Others are: (*a*) continuance of river basin studies to identify and manage for recreation lands found to be primarily valuable for that purpose, and to point out ways to avoid or minimize damage to existing valuable recreational resources, (*b*) provision of minimum basic recreational facilities on Federal reservoir projects—such as those necessary for access, sanitation, safety, and protection of property, which have been deferred thus far because of the lack of a national recreation resources policy, and (*c*) welding together river basin study recreation surveys into a consistent and coordinated nationwide plan as authorized by the Park, Park-

way, and Recreation Area Study Act of 1936. The place of strong State park systems should be recognized in such a plan.

The subsection seemed to be in agreement that there is further need for more natural areas—many of which may be small—that must be left entirely alone except in special cases where a minimum of management may be desirable. In these areas plant and animal communities may be preserved as a sample of the native and original landscape. The value of such areas includes inspiration, outdoor laboratories for research and study, check-control areas to compare with managed lands, and places where all plant and animal life has a right to live. We need to preserve examples of many types of vegetation and natural features not yet preserved.

In discussing the need for more highly developed recreational areas in National and State parks it was agreed that more funds are needed for these areas in National and State parks and forests. In many cases funds are not available for maintenance of those already developed. In many States, the park systems are the poor relations of other conservation activities.

However, it is questionable whether all recreational demands need to be met by these areas. Acceding to all demands may seriously impair or destroy them by too many roads, cabins, dancehalls, golf courses, knickknack shops and mediocre eating places. Those who desire these facilities in our forests and State parks are our neighbors, lodge brothers, and business acquaintances—Mr. Average American. Only when we convert them to the proper use of our park and forest recreational facilities can we blend economic and esthetic needs and ideals into one program.

The group considered that the problems of State parks are similar to those of national parks. But they are closer to home and serve greater numbers.

The conferees agreed that there is a fast-increasing demand for small recreational areas, as required for suburban and urban centers, and rural areas. Discussion brought out the need of obtaining such areas early, before land values increase further.

In order to adequately service local demand, there is a need for better means of evaluating recreational requirements of people and communities, for proper classification of land and zoning guides, and for standards to aid in the development of the facilities themselves.

The suggestion was made that there should be, in connection with every school, both a natural area representative of the region, as a basis for nature appreciation, and a recreational area as well. Recretional and educational leaders should work together. It was pointed out that people working together have often obtained many recreational facilities through fund raising, without formal floating of bond issues, and that maintenance problems are fewer when the community itself is responsible.

There is a need to act now, as well as to plan for the future. For example, the opinion was strongly expressed that local park areas should not be molested (as the proposed highway through Rock Creek Park) but that recreational areas in the Nation's Capital should be preserved intact as an example of leadership to all the people in this important field of resource management.

The subsection considered briefly, but did not fully explore, the many facets of an integrated public program of industrial and recreational use of public land of the United States. It was pointed out that in the early part of the present century, the greatest threat to the recreational values were exploiters and that today the primary threat is from the Federal Government itself. Proof of this statement lies in the destruction of natural areas by large impoundments constructed by the Bureau of Reclamation and the Army engineers. Further proof that the Federal Government's activities are in conflict is the fact that the United States Department of Agriculture, within the Department itself, provides subsidies to drain wet land while at the same time it provides technical assistance to create ponds, even in some instances on the same farm.

There is also conflict in management procedures and permit charges on western rangelands where the United States Forest Service follows one set of procedures, the Bureau of Land Management another. One way to get integration is to implement the Coordination Act (Public Law 732) which requires review of water impoundment structures by Federal and State wildlife agencies. Funds have not been appropriated to permit proper review of these projects.

It was suggested that another possible way to obtain integration of public programs is to establish a Federal Department of Natural Resources or to establish an impartial Board of Review, as recommended by the Natural

Resources Council, to give broad-scale guidance to the development of Federal construction projects.

SUBSECTION D—WATERSHED VALUES

Gordon K. Zimmerman, rapporteur; D. Harper Simms, rapporteur; chairman, Harold Wilm.

The opening session of the subsection on watershed values was marked by repeated expressions that thorough treatment of watershed lands is imperative to the conservation and development of the Nation's renewable natural resources and to the development of the country's great river basins.

The session also heard declarations that there is an imminent need for establishment in the United States of a "balanced, national land and water policy."

Upstream watershed operations are essential, according to presentations made at the session, because they—

1. Reduce frequency and size of the "smaller floods" on the smaller streams where more than half of the total annual flood damage in the United States occurs.
2. Improve forest, farm and ranch productivity.
3. Protect resources for sustained use in the future.
4 Contribute to the protection and prolonging of life of downstream flood control, power, and similar installations.
5. Reduce siltation of river channels and reservoirs.
6. Improve the net benefits from expenditures for resource work.

Upstream watershed protection, it was emphasized, should be planned and undertaken as part of a balanced program, along with the planning and construction and downstream installations.

It seemed to be generally agreed that there is an urgent need for the Nation to move beyond study and begin more vigorous and widespread action in watershed conservation and development work.

Specific suggestions called for:

1. Establishment of a balanced national policy for land and water resources.

2. Conservation and development of these resources, together with related resources, in a coordinated, integrated program, watershed by watershed.

3. Establishment of a neutral, nongovernmental body to evaluate the progress of the recently inaugurated $5 million pilot plant operations on some 65 watersheds.

4. Greater participation by the several States in watershed programs, together with a conscious effort by the States to revise and otherwise bring their laws up to date to permit the best possible degree of effective participation in such work.

5. Allocation of funds, in annual Federal and State budgets, commensurate with the importance of resource conservation and development work, and with annual revisions up or down made in relation to the total budget.

6. Clarification of the statutory authority and responsibilities of the Federal agencies working in the conservation field. Particular reference was made to agencies in the Departmetn of Agriculture, Interior, and Defense. Actual responsibilities for each agency should be spelled out and defined, either by legislation or executive direction, it was held.

7. Establishment of a Presidential Commission, or a body operating at the executive level in the Office of the President, as a means to achieve balance and coordination of the activities of Federal agencies in the conservation field. Personnel of such a Commission would be enlisted from Federal and State agency sources and would also include private citizens. As a companion move, it was urged that some means be found to increase State and local participation in resource and watershed operations.

Discussion at the opening session also stressed a need, regarded as vital, for sharply increased research—social and economic, as well as physical—into all aspects of watershed work. Factual information now available is inadequate, not only as to the effectiveness of various land and water treatment measures in their various combinations, but as to the social implications and economic benefits of watershed programs. As one possibility, it was proposed that social and economic studies in the watershed field should be made by an impartial, nongovernmental organization. The importance of basic land and water inventories was also mentioned.

Widespread emphasis was given to a nationwide need to enlist every complexion of civilian interest into the watershed development program. Urban and in-

dustrial organizations and individuals have as vital a stake in the watersheds, it was pointed out, as rural groups and persons.

Considerable discussion brought out that watershed districts, or watershed conservancy districts, might be the most suitable mechanisms for achieving integration of agency effort in watersheds, as well as widest possible participation by interested organizations and individuals. The success of the Muskingum Conservancy District in Ohio was cited as a model of what might be accomplished elsewhere. At the same time, several conferees called attention to the importance of noting regional and geographic differences in developing watershed plans and programs. For areas involving more than one State, it was suggested that interstate compacts might provide a workable organization for watershed activities.

At another stage of the session, conferees were reminded that across the country watershed organizations of many kinds have been formed. Some of these have been successful; others have met with difficulties. The different forms of organization should be evaluated, it was held, as a means of guiding future developments in watershed organization.

According to speakers, land treatment and improvement in watersheds—both on forest and range lands and on crop and pasture lands—contribute to flood prevention, but there are wide variations in the degree of this contribution.

On watershed lands, the subsection on watershed values heard, such factors as ownership pattern, forest cutting practices, the type of cropping, and prevailing condition of the watershed cover influence markedly the contribution to flood prevention. The effectiveness of undisturbed cover on water runoff and silt production may be an unrealistic measurement, it was pointed out, because most watersheds are now used for some type of production and are consequently modified by such use. Furthermore, the conferees were told, programs of watershed management must be acceptable to the people using the lands. Rarely would these people be willing to maintain cover in an undisturbed condition.

As in the initial session of the subsection, it was emphasized that the human problems associated with watershed treatment may be greater, at least at the present time, than the acknowledged physical and technical problems which still persist.

At that same time, several speakers at the session stressed that there is still inadequate knowledge about the measures and techniques necessary to control rivers, large and small. Conferees were reminded that this lack of knowledge is aggravated, in some areas, by the fact that technical appraisals of treatment work must be modified by locally prevailing ownership and institutional factors.

In this connection, it was pointed out that land ownership in the United States connotes the right of an owner to use land as he decides, regardless of what the result may be downstream. Further, the profit-making desires of upstream owners may thereby impinge on the profit-making desires of landowners downstream, including not only dryland farmers, but irrigation farmers, industries, and domestic water users.

Under these circumstances, it was suggested that research should be undertaken to examine the possible incentives—financial and otherwise—which would encourage upstream landowners to participate on a sustained basis in watershed maintenance and improvement programs, and to change from traditional to improved practices. Changes of this kind can be costly to the individual land owner, it was pointed out, and the problem must be approached realistically.

Further, in view of the practical fact that an ideal cover cannot be maintained on watersheds, it was proposed:

1. That pilot-plant demonstration watershed operations be undertaken on as many types of watersheds as possible as an aid to knowledge and experience;
2. That research and testing work in connection with watershed operations be pursued diligently and continued well into the future, and
3. That basic watershed research be initiated and continued.

The flood prevention effects of land treatment on crop and pasture lands can be measured only in terms of averages, covering a series of storms over periods of months or years, it was stated. According to the presentation, reductions can be achieved in both water runoff and soil loss by such treatment, but there are wide variations, quantitatively, in these reductions. The range of results depends on local conditions prevailing at the time in the watershed.

Practices commonly accepted by farmers, and primarily designed to protect and improve agricultural production, such as contouring, terracing, and im-

proved rotations, were declared to result in reductions in runoff from 5 percent to 30 percent, and sediment reductions frequently exceeding 50 percent.

A spirited discussion of upstream and downstream improvement programs underlined the existence of disagreement as to the relative effectiveness of these two basic approaches to flood prevention. It was apparent in the discussion, however, that terms are frequently used loosely and need to be defined more clearly if there is to be a clear understanding of the positions.

It was pointed out that distinctions must be made, for example, between large catastrophic-type of floods and small floods. Along the same line, it was suggested that the purposes of flood-prevention operations should be more accurately specified, as between those operations designed primarily to protect large urban areas, and those operations designed primarily to protect agricultural areas but having secondary effects downstream.

Attention was directed, too, to the varying understandings as to what constitute big dams and what constitute upstream detention reservoirs. Discussion brought out that not only is there a common lack of understanding about the standards for identifying these two general types of structures, but that the problem is further complicated by the existence of a "twilight zone" of structures intermediary between these two.

Non-Government participants complained more than once over the lack of agreement still existing among major Federal Government agencies on watershed development programs.

Conferees presenting information about upstream watershed treatment declared that such work has had variable, but pronounced, effects on smaller floods in smaller streams. In this connection it was pointed out that a substantial amount of the flood damage taking place in the United States each year occurs in rural areas.

Meanwhile, other conferees pointed out the wisdom of using caution in making claims for the flood-control benefits to be obtained from upstream-watershed programs.

Some conferees held that the lack of adequate streamflow data over past years on the smaller streams made appraisal difficult and complicated the evaluation of watershed operations insofar as flood control is concerned.

Regardless of these complicating factors, it was suggested that the imperative nature of watershed treatment should be no barrier to proceeding with the work. In this connection, two basic preliminary tests were suggested:

1. What are the damages, as a whole, that we must deal with in this area? and

2. What are our objectives in this area; i. e., what do we want and hope to accomplish by work in this watershed?

At its final session, the subsection on watershed values was presented with a set of six suggested guides, or positions, with respect to watershed conservation and development. These were:

1. The watershed is the logical unit within which people can work together on the conservation of their resources—based on the belief that people in watersheds have more in common than people in other political units.

2. It is the responsibility of all the people to participate actively in the preparation and prosecution of their own resource programs.

3. To be effective, watershed programs should deal with all resources and all related problems, preferably simultaneously.

4. People of watersheds should secure cooperation between all assisting agencies—Federal, State, and local—but retain control of the program for the people of the watersheds.

5. Watershed work should be directed toward the greatest benefits of all interests in the watershed.

6. Costs of watershed programs should be borne principally by local people (individuals and organizations), and by the various watershed interests, in proportion to the benefits received.

Consistently, throughout the sessions of the subsection, the human and social aspects of watershed conservation and development were emphasized. It was stated repeatedly that both the initial approach to landowners, as well as subsequent cooperative activities, is of the greatest importance to successful initiation and progress with a watershed program.

Similarly, all sessions of the subsection heard repeated presentations of the need for additional research, both basic and applied, in all pertinent sciences, to add to the fund of available knowledge about watersheds. Voices were raised,

coincident with these presentations, to urge that the time is at hand when actual watershed operations are now at least as necessary as additional study. Discussion brought out, however, that most conferees agreed that actual watershed work and research should both receive full attention.

The conferees heard presentations endorsing various types of watershed organizations, but most attention was devoted to the conservancy districts of the type established in Ohio, and to the watershed associations of the type established in Nebraska and Kansas. The Brandywine Valley Association, with headquarters in Wilmington, Delaware, also came in for considerable favorable discussion.

In these discussions of watershed organization, it was repeatedly stated that city people and farm people must be brought to recognize that they have a common watershed problem which can only be solved by joint action.

Many among the conferees clearly believed that this teamwork of rural and urban people is a vital key to successful development and progress in watershed work.

Further, it was urged that a joint understanding by rural and urban people that they have a watershed problem—and that it is possible to solve such a problem—is a fundamental step toward successful watershed action.

Discussion brought out that six basic tools are available to help in prosecution of the watershed job:

1. Research.
2. Education.
3. Technical assistance.
4. Direct aid, including payments.
5. Credit.
6. Supporting legislation.

In developing a watershed association program, the experience of one organization showed the following chronology of action:

1. Cooperation by all agencies of government—Federal, State, and local—to determine the facts about the resources, conditions, and needs in the watershed.
2. Publicity throughout the watershed on these facts.
3. Organization of action programs within the watershed, with local people placed in key positions to help get the job done.
4. Establishment of any necessary, new local agencies.
5. Coordination of agencies' activities.
6. Publicity on achievements of the program as they develop, with emphasis on the dollar benefits to the citizens.
7. Continued financing of the program.

Other discussions of the subsection brought forth statements that water yields from watersheds can be improved or increased, as the needs may be, by—

1. Manipulation of upland vegetation.
2. Control of soil erosion.
3. Better practices in the agricultural use of water.
4. Control of riparian vegetation, and
5. More efficient use of ground water in agriculture.

Although water yield was once regarded as a problem confined to the arid and semiarid regions of the country, speakers pointed out that it is now a matter of increasing concern to both agriculture and industry in the humid sections of the Nation.

In all sessions, the conferees were told, there are at least three basic stages in improving or increasing water yield:

1. Maintenance of the watershed in good condition to take in and deliver water,
2. Repair of past damage to the watershed caused by unwise use, and
3. Improvement of the watershed with beneficial practices and installations.

Water in a watershed can be managed either as a crop itself, or for the benefit of regular crop production. The objective varies in different parts of the country, it was pointed out, and management can be adjusted to obtain the desired result.

Although considerable scientific data has already been assembled with respect to the characteristics of watersheds, several of the speakers indicated that much more work is needed in both research and in inventories of land and water resources. Specifically, they mentioned that more data is needed on:

1. Water infiltration;
2. Soil moisture;

3. Evapo-transpiration;
4. Rainfall;
5. Ground water;
6. Water runoff; and
7. Land characteristics and conditions.

At the same time, it was urged that a real effort be made to assemble and collate watershed data of various kinds now in existence in many places throughout the country. Scientists and others working in the watershed field do not know just how much information is actually available, it was said.

Meanwhile, other speakers declared that even though scientists may not have all the basic data they want, progress with actual work on the watersheds should not be delayed because of this shortcoming. It was urged that the country make the best possible use of the data available and proceed with field operations. Several speakers expressed a belief that an action program in the watersheds would stimulate interest—and appropriations—for the needed, additional research.

Some doubt was expressed as to the degree to which data obtained on a small area could be translated for use in large areas.

One conferee offered a list of suggestions relating to watershed research of the future. He called for—

1. Development of a wider recognition and clearer understanding of just what watershed research is after, and what can realistically be done;
2. Better coordination between the agencies carrying on research;
3. Establishment of an overall research planning group, either governmental or nongovernmental;
4. Greater participation in watershed research by agencies and organizations outside the Department of Agriculture;
5. More support for research by agencies and institutions, both public and private, who share in the final benefits of research;
6. A shift away from the emphasis on applied research, in the direction of basic research; and
7. Periodic appraisal of the progress being made in watershed research.

MIDCENTURY CONFERENCE ON RESOURCES FOR THE FUTURE

(Subject to further comment by this section's participants)

Section III: Chairman, Gilbert F. White; cochairman, Abel Wolman; Maynard M. Hufschmidt, rapporteur. December 4, 1953.

WATER RESOURCES PROBLEMS (REVISED SECTION DIGEST)

INTRODUCTION

On December 3, 4, and 5, 1953, over 200 earnest and hard-working people gave intensive consideration to the problems involved in the supply and use of our fresh water resource. They did not consider marine resource problems, nor did they take up most of the important problems and issues concerned with the development and marketing of hydroelectric energy. These latter problems were included in Section V, Problems of Energy Resources.

Even within these limits the field is vast. It includes the supply and demand for water and purposes of water use and control, including flood control, irrigation, and drainage to increase food production, navigation, domestic and industrial water supply, pollution control, recreation, and fish and wildlife. In fact, it covers the whole range of situations and issues involving water all the way from precipitation on the slopes to the final flow of water to the sea.

In order to attack this problem in an orderly way, the section concentrated its work on three broad areas of study, each the assignment of a subsection. These areas are:

A. The supply, use, and competitive demands for water.

B. The division of responsibilities for the water resources job among private groups and local, State, and Federal Governments.

C. The principles of evaluation and reimbursement of water resources projects.

This statement presents a brief report of the results of the deliberations of the three subsections and reflects the views of the entire section as expressed at the final meeting on December 4.

Overall considerations.—In the background paper on water resource problems which was made available to participants before the opening of the conference, certain general considerations were set forth as to the nature of water resource problems. There was general acceptance of these basic assumptions throughout the subsection and section discussions. These basic considerations are:

1. Water is a most important vital resource. Considered nationally, it is abundant. However, ever-increasing demands require that it can no longer be taken for granted anywhere, even in the humid East. It is particularly vital in the West.

2. Watersheds and drainage-basin units have their own individual characteristics, and provide a natural and convenient basis for planning and operations. Their infinite variety requires individual treatment of problems rather than the wholesale application of any single generalized approach.

3. River-basin developments ought to be planned to serve all of the multiple purposes which are valid and feasible in each particular case.

4. There is an organic interdependency between fresh water and land resources which requires that they be considered together in the process of planning and development.

5. The task of water-resource conservation and development which is ahead of us is huge and important. The problems are often complex and transcend political boundaries. It will require all of our knowledge, skill, and ingenuity in order to do the job. It will also require mobilizing the best efforts of individual citizens, private agencies, and local public agencies to assume their proper responsibilities in this work, in cooperation with the Federal Government.

With the background of these general considerations, the subsections considered their particular areas of study. The results are reported in the following:

A. SUPPLY, USE, AND COMPETITIVE DEMAND

Supply in relation to use.—Put most broadly, it appears that considering the country as a whole, the supply of water in the Southwest (from western Texas to southern California) is generally less than present and foreseeable demands, while east of the Mississippi River, the supply is much more generous. But this generalization must be immediately qualified. In the West, it will be possible to develop considerably more water, but at higher costs, which people may reasonably be expected to pay, considering that such an essential resource as water now costs relatively little. In the East, certain areas, both industrial and agricultural, are now coming into short supply; e. g., dairy areas in Ohio and Indiana; industrial areas in New Jersey. As water demands continue to grow greatly in the East, further stringencies will occur. Air conditioning and supplemental irrigation are two examples of new demands on supplies east of the Mississippi; industrial use generally has also increased greatly there in recent decades. Another most pertinent qualification is that the supply and demand vary greatly from local area to local area, East and West, given the tremendous variations of climate, topography, land use and settlement, and degrees of industrialization. Thus, generalizations, unless critically evaluated, are invalid. However, it was the view that demand for water generally has grown so greatly since 1900, and makes for such complex local and regional situations, that much study, adjustment, and action on water-resource problems is now imperative. It was suggested, particularly, that long-term averages of runoff and rainfall should be used only after critical evaluation.

There was little critical discussion about the extent of water shortages over the country.

Increasing demand and emerging new uses.—It was observed that industrial use of water generally has increased tremendously, although it is difficult at present to estimate and to classify this use satisfactorily, because the information available is fragmentary. The recent rapid expansion of supplemental irrigation in the East led a speaker to cite a prediction that more water may some day be used for irrigation in the East than in the West. It was pointed out that this new use would foster great competition in rural and urban fringe areas, and that water codes in the East should be developed to adjust such increasing demands to local and regional supplies in an orderly and nonwasteful manner. Progress in some Eastern States on this matter was noted.

The similar rapid increase in use for air-conditioning was recognized as an emerging competitive demand that may become large. One participant suggested that communities inventory their air-conditioning units, so that their impact on supply could be measured. While the consumption of water by this

use may be small in overall terms, it can affect the availability of local supplies greatly. The time may come when using water for air-conditioning will be a luxury. Discussion of the related matter of industrial cooling towers brought out that re-use of water for this purpose is becoming more common. Recharge of ground water aquifers with return cooling water has also been successful, as on Long Island and in certain areas of New Jersey, but an unfortunate rise in ground-water temperature has sometimes resulted. It was questioned whether ground waters of good quality and low temperature should be pumped for this, rather than for other more appropriate uses.

Consumptive use and measurement of use generally.—All phases of the entire cycle of water supply and use—precipitation and run-off, ground water, industrial, domestic and irrigation uses, and waste water discharges—should receive much more intensive study and measurement. Disagreement was voiced about the relative importance in the East of measuring consumptive use which was defined as water lost for further use, such as water transpired by vegetation, incorporated in manufactured products, used up in industrial processes, or rendered unfit for any further use. One person stressed that in the East the matter of water quality is more important than availability, although inventory of a few items of use may ultimately be desirable. Others countered that the new emerging uses in the East, such as supplemental irrigation, made consumptive use studies essential. The matter is not simple, since the overall significance of withdrawing or consuming a given quantity of water varies with the point of withdrawal or use. A withdrawal from a stream for a transwatershed diversion, for example, results in complete consumption so far as that basin is concerned. Also, as water demands in the East approach available supplies, droughts will have dislocating impacts more severe than in the past.

Water pollution.—It was pointed out that water pollution control is necessary, although opinion was sharply divided on the degree of water pollution control practices necessary to maintain or improve the quality standards of the Nation's streams. One group maintained that continued upgrading of water quality is essential to the national interest. Another group held that eventual solution of the problem would come through a cooperative approach which recognizes the desires of all interests concerned with the particular streams affected. This approach would be helpful by increased technological research in waste treatment methods, and would be stimulated by regulatory measures when required. Major sources of pollution were identified as industries, municipalities, septic tank effluent in urban fringe areas and denuded watershed areas. Some opinion was expressed that industry could well assume a greater share of the burden, the increased cost of which the consumer should be prepared to pay; conversely the opinion was expressed that waste treatment is keeping pace with advances in practical treatment methods.

The problems of adapting regulatory methods to the control of pollution were discussed. Clearly, the basic issue is how to determine the public interest by some reasonable procedure since the level of control required will affect various interests that make use of the stream to different degrees. An opinion was expressed that the public interest would be served by uniform regulatory laws with classification of streams over large areas, while another view was that such classification tended to become frozen and to ignore the relations of pollution problems to the standard of quality desired at any given location. On the other hand, it was pointed out that regulatory measures had resulted in pollution abatement, and that the proposal of a model water pollution law does not suggest the adoption of uniform regulations ignoring area differences in water quality requirements.

Continued and increased basic research was considered desirable for (1) improved and new waste treatment methods; (2) ecological processes occuring in the streams; (3) toxicological effects of chemical pollutants; and (4) determining whether viruses are water borne. To the proposal that permits be required to discharge wastes to water bodies, it was asserted that this procedure was presently required over much of the Nation.

As to financial inducements for pollution abatement, it was pointed out that 4 bills have been introduced in Congress which provide for a subsidy through a 5-year tax amortization for industrial waste treatment works.

Ground water problem.—Concern was expressed regarding depletion of ground water and accompanying increased pumping lifts. As to whether or not such depletion is serious, it was pointed out that, although ground water generally is a renewable resource and its annual replenishment may be calculated, in some places of low rainfall and recharge, ground water is mined and used as any

other nonrenewable resource. In many cases such mining has resulted in the creation of communities with sufficient capital to seek other more expensive sources of water. According to this view, any sin in mining water lies in the failure to recognize that depletion is taking place and that it is ultimately necessary to seek other sources.

The consequences of excessive drawdown of water tables in coastal areas with consequent possibility of salt water intrusion was mentioned. Possibilities of replenishment by the following methods were discussed: (1) artificial ponding using floodwaters or sewage effluents, (2) pumping through wells, (3) land management, (4) overirrigation, and (5) importation of waters from outside sources. Experiments in California to interpose a fresh water barrier at the ocean shoreline by introducing sewage effluent into the ground were noted. Subsidence, as a consequence of consolidation of certain depleted aquifers, and the subsequent dislocation of surface structures, in Texas and elsewhere, was described. One participant stated that the use of acquifers for the storage of water instead of more expensive surface storage had been generally overlooked in this country. In some areas underground storage may be the only storage feasible.

Discussion of regulating measures used in the various States to conserve or regulate use of ground waters revealed that there was no uniformity in such regulations. In general there are fewer States having such regulation in the East than in the West. It was proposed that regulation should be on a local level under a framework of State laws.

Competitive demands.—Competition in water use occurs in two general ways: (1) conflict due to difference in geographical location, for example, in the Missouri Basin between the subhumid region and the more arid area to the west, and (2) that caused by functional conflicts, for example, between those desiring development of supplies for certain uses used as irrigation and power and those interested in recreation and wildlife values. The conflict of these opposing interests was discussed at great length with no general agreement reached. Numerous cases were cited involving usage of water for domestic and industrial purposes, irrigation, power, navigation, air conditioning, recreation and wildlife preservation. The importance of recreation as a purpose of water resources development, and the necessity for safeguarding the inviolate character of national parks, monuments, and wilderness areas, was stressed by several participants. The competitive use of reservoir storage site with recreation and wildlife areas was pointed out. One possibility of resolving some of the conflicts in water use involved the use of multiple-purpose projects, but there is disagreement as to whether all uses can be reconciled by this approach. The feasibility of use of multiple-purpose reservoirs as a means to satisfy competing demands must be examined on a project-by-project basis, as generalization is not possible.

Conservation of water.—With respect to reuse of water in industry, the Fontana steel plant in California was cited as an example of the possibilities for industry to save water by this means. The use of the effluent of the Baltimore sewage system by a nearby steel plant was described as an example of a good way of furnishing industrial water cheaply, and of dealing with waste water economically. Many persons stressed that the care and improvement of watershed lands would help to stabilize the water yield from the lands. Such care is essential also to protect water quality for municipal supply and for recreational purposes. It was pointed out by one participant that development of methods of reuse should preclude development of costly new supplies.

Industrial water-use estimates.—Several individuals brought out the great need to improve the measurement of use, reuse, actual consumption, and discharge of water by industrial plants. Present data are fragmentary and unreliable, and make for wide variations in overall industrial use estimates.

Destructive uses.—While the reuse of water is common, some uses are relatively destructive. The deterioration of return irrigation waters as they travel downstream, due to the accumulation of salts, was cited.

Weather modification.—The possibility of developing an additional source of water through artificial rainmaking was discussed. In a recent study of rainmaking undertakings, the Weather Bureau reported that not enough data are currently available to determine the practicability of weather modification. However, one participant emphatically stated that some value could be derived from efforts at weather modification.

Basic data.—The meeting was unanimous in emphasizing the great need for more adequate collection, analysis and speedy publication of basic data on climate, and on water and associated land resources. A substantial backlog of such data, collected principally by Federal agencies since the 1930's, should be utilized.

The financing of such work has been and is still deplorably insufficient. Recent progress by some States in this direction was noted. Specifically, (1) the effect of land treatment and of upstream measures for flood control and other purposes should be analyzed intensively, and as quantitatively as possible; (2) consumptive-use studies are needed. At present, for example, we have little guiding information as to net water use by industrial plants or communities; (3) more data on the reuse of water by industry is necessary to arrive at better estimates of industrial water demands; (4) collection of data on air-conditioning installations is desirable in order to measure present and future demands for this purpose; (5) State or Federal evaluation of present efforts and methods of pollution abatement is desirable to establish the amount of progress which is actually being made; (6) the study by State or Federal agencies of small drainage areas of 1 to 50 square miles has been neglected; (7) the desirability of having States and other units of local government do some of this data collection and analysis work was emphasized, but the need to coordinate work by such local groups on a national basis was also stressed; (8) basic data programs should be flexible, and provide for both current and long-range needs; (9) the collection and analysis of data might well be coordinated, and directed to local problems, by regional centers.

B. DIVISION OF RESPONSIBILITIES AMONG PRIVATE GROUPS AND VARIOUS LEVELS OF GOVERNMENT

The subsection discussed the five major questions posed by the steering committee. The results of this discussion are briefly summarized in the following:

1. How can we assure that the resources of private enterprise, along with those of local and State governments, are given the maximum opportunity to take responsibility for those phases of water development and use which most nearly fit their capabilities and interests? How can the Federal agency programs and policies be adjusted to bring about a situation of coresponsibility in those areas which clearly require Federal participation?

There was no challenge of the principle that it is both necessary and desirable to increase private, State and local participation—on a responsible basis—in the development of water resource projects. The fact was developed that the many State and local bodies differ markedly in their respective capacities to take on additional responsibility for the planning, financing, construction and operation of such works. The size and nature of the administrative organization should depend, in part, upon the geographical extent and technical complexity of a given project or program. There seemed to be a rather general feeling that responsibility for any particular phase of water resource development should be placed at the lowest possible organizational level at which it could be adequately discharged; but subject to the condition that activities at all levels shall be in harmony with some comprehensive and coordinated basin plan. It was pointed out, however, that basinwide multiple-purpose undertakings generally require the active participation of the Federal Government. Some indicated that the job of planning tends to become more complicated in regions of limited water supply where appropriation laws relating to water prevail. It was also pointed out that the Eastern States which have riparian laws relating to water are now beginning to experience the stringencies of conflicting consumptive water use. In general, private enterprise will be guided in its exercise of initiative by whether or not projects produce vendible commodities or services that can be profitably marketed. State and local public bodies will be strongly affected by how far the Federal Government will go in the sharing of a stated part of project costs, especially the nonreimbursable portion thereof. Attention was drawn to the fact that even under present law there exist several opportunities for increasing the assumption of operating and other responsibilities by local or State public bodies, opportunities which have thus far not been fully exploited. Accelerated withdrawal of Federal participation in these areas might stimulate greater local action.

Very little headway was made in the development of specific ideas as to new methods—i. e., as to the "how" of the question. One new alternative advanced was that of setting up "mixed corporation," in which private, local public, and Federal capital and administrative talent would be pooled—with authority being shared in rough proportion to the share of investment. Another concept would be to set an upper limit on the Federal financial contribution, say 50 percent or less, so as to stop short of Federal control and domination, while at the same time permitting the Federal Government to offer an incentive for local initiative, or—when required—a spur to local action.

The important problem of defining the public interest was mentioned, but the subsection did not come to grips with it. Also, the legal problem of defining the constitutional limits of Federal responsibility for water resources was mentioned, but not taken up in detail.

2. Is the interstate compact type of organization a suitable vehicle for water resource development planning? For financing? For construction? For operation?

It was pointed out that the interstate compact is a suitable device for coping with the allocation of water among States on interstate streams, for interstate cooperation in pollution abatement, and for similar limited purposes. On the question of its more general application to more comprehensive problems, opinion was sharply divided. Some supported the view that the compact device could be extended to embrace a broader range of functions, especially in the realm of planning, or even financing. Several took the view that the compact device was much too slow, uncertain, and cumbersome to cope with the dynamics of interstate cooperation in comprehensive basin development. It was pointed out that there are no existing examples of the successful application of the compact approach to a complex problem situation of the type under consideration.

The view was expressed that an additional drawback to the compact approach is that its negotiation and ratification has traditionally consumed a long period of time, often measured in years.

Some consideration was given to the possibility of using the interagency basin committee device in conjunction with interstate compacts.

3. How should our administrative talent be organized at the regional or field level? What type of structure, and what set of powers, would best serve the combination of private, local, State, and Federal interests?

It was brought out that some form of organization was needed to bring about coordination within regions or major river basins. The function of these regional agencies was described as that of preparing broad and integrated regional plans and coordinating the work under them.

Discussion of the form that regional organizations should take centered upon—

(*a*) Interagency committees on which States are represented (generally similar to those now in being in the Arkansas-White-Red, and the New England-New York regions).

(*b*) Basin commissions (of the general nature of the body suggested by the Missouri Basin Survey Commission).

The interagency committee approach was commended by a number of persons. But even the advicates of such bodies indicated that the present committees should be strengthened and improved in certain respects. To this end it was suggested: (1) that the "rule of unanimity" be dropped, (2) that firm agreement on methods of evaluation be reached between all Federal agencies at top levels, (3) that sufficient and balanced appropriations be provided to the agencies cooperating in planning, (4) that technical people be given freedom in arriving at the best plan, and (5) that States do a better job of keeping up their end of interagency cooperation.

It was pointed out that the Missouri Basin Survey Commission appraised the performance of the Missouri Basin Inter-Agency Committee and had found it wanting.

Doubts were expressed by several of the need for regional commissions of the type recommended by the Missouri Basin Survey Commission. The point was made that agencies cooperating in present interagency efforts recognized existing weaknesses and were moving to correct them.

The subsection was warned that obstacles in the way of achieving coordinated regional programs could not be overcome simply by setting up new organizations, or modifying existing ones; that until a unified national water resources policy is adopted by Congress such regional mechanisms cannot be expected to be fully effective.

One participant advocated that Federal and State voting power on interagency bodies be made equal.

Several persons called attention to the progress made in the Tennessee Basin under the TVA. They rejected intimations that arbitrary actions had been taken by that agency, and stated that harmonious cooperation with local agencies has been attained. Some from other regions indicated that they did not favor the valley authority approach for use in their areas.

4. Could better organization of the Federal Agency structure pave the way for improved working relationships at all levels?

A proposal was made that Federal machinery be reorganized to place in separate agencies: (*a*) Planning; (*b*) construction; (*c*) operation and maintenance. A number of participants voiced opposition to this proposal.

One view advanced was that organization must start at the regional level, and that once a regional system had been established the Federal structure should be adjusted to it.

It was again pointed out, in connection with this question, that major hindrances to progress were not in the realm of organization, but were: (*a*) Lack of a unified national policy, (*b*) inconsistences in the basic policies set out in various existing laws, and (*c*) the lack of funds, and the lack of balance in the funds available to the cooperating agencies.

One person pointed out that no form of organization could be expected to yield the results desired unless the agencies involved were possessed of good will and a real desire to cooperate.

5. Is there need for a national Board of Review?

There was a division of opinion upon the desirability of setting up a national Board of Review. A number of participants expressed the opinion that, if coordinated planning were achieved, such a Board would be unnecessary and would only impede the project authorization process. Those who support the general concept are not in agreement as to either the proper functions and powers of such a Board, or as to where it should be located. Some prefer a new and separate facility in the Executive Office of the President. Others advocate a strengthening of the role of the Bureau of the Budget in this matter. Still others feel that we need a "strong national board or commission" under the control of Congress.

The opinion was expressed that, if a board of review were to be established, it should enter in at the planning stage and not confine itself to reviewing plans after they have been completed and after the agencies have committed themselves.

C. EVALUATION AND REIMBURSEMENT

Project justification.—What determines whether or not public investments in water resource projects and programs are justified? Two extreme positions and a middle position were discussed, with discussion limited primarily to Federal projects.

The first position examined was the judging of water resources developments by the test of financial feasibility. Reasons given in opposition to this approach were:

1. If a project is financially feasible, should it not be left to private enterprise rather than be undertaken by the Federal Government? A principal justification for public investment in any project is the broad public nature of the project benefits and the difficulty of assessing all of the costs on the basis of those benefits.

2. Narrow evaluation of projects on the basis of expected financial returns does not adequately protect resources for future generations and may prevent properly integrated and comprehensive river basin development.

3. A community may wish to develop a project for entirely different reasons than would a businessman.

The second and opposite approach to water resources developments was posed as follows: Should water resource projects be evaluated solely on the basis of a judgment of public welfare, without any attempt at financial appraisal or economic analysis, as is done in the case of public education? This approach was also criticized, for the following reasons, among others:

1. Some fully vendible services, such as power, are included in multiple-purpose developments, and their costs should be fully repaid.

2. While some benefits, such as recreation, may be intangible, others are tangible and amenable to monetary analysis.

3. A practical test is required to establish priority among projects.

4. Failure to evaluate benefits in monetary terms makes difficult any attempt to recapture unearned increments accruing to private individuals.

A middle position received more extended discussion. With regard to financial appraisal, the position was advanced that some financial contribution by some project beneficiaries constituted a useful check on and a supplement to the economic analysis of the justification of the project. This position was supported by some. On the other hand, others pointed to the difference between reimbursement and economic analysis and indicated their belief that sound economic analysis was a sufficient test of project justification.

Economic analysis.—The largest part of the discussion centered on the use of economic analysis to determine the justification of water resource projects. While no subsection member expressed opposition to some use of economic analysis to test the justification of some aspects of water resource development, differing views were expressed on the following points:

1. The extent to which reliance can be placed on economic analysis.
2. The extent to which project effects can properly be expressed in monetary terms.
3. The relative importance of project benefits which can be expressed in monetary terms and those which cannot, i. e., the importance to be attached to the benefit-cost ratio.

With regard to the first point, two positions emerged. One ran as follows: The purpose of economic evaluation is to measure the increase in welfare that a project will produce. There is no real difference between economic evaluation and evaluation of a project's contribution to "welfare." If an economic evaluation does not measure the effect of a project on the general welfare, that is the fault of the analyst, not the fault of economic principles. (Economic evaluation is not restricted to evaluation of market effects.) Our present method of measuring economic effects of a broad social nature may be inadequate. But this can be cured by expanding the scope and improving the tools of economic evaluation. It is true that the ultimate decision as to particular water resource projects may well be political. But the job of the analyst is to make an economic evaluation of the project's contribution to the general welfare without interposing any of his own value judgments.

The opposing position was this: The effects of a project are only partly economic; therefore, to restrict evaluation to economic effects is to produce lopsided analyses. There is no such thing as "general welfare," for economists to measure. The analyst should not interpose his value judgment in evaluating the project, but he must determine what different groups affected by a particular project desire and he must analyze the extent to which the project satisfies or blocks the desires and needs of these groups. This will involve disciplines other than economics.

Concerning the second and third points, several persons took the view that the science of economics has not yet advanced sufficiently to permit accurtae monetary measurement of benefits. Most of them held that, pending further progress, project justification should not hinge on the benefit-cost ratio alone since this ratio at best accounts for only part of the project effects. One participant, who addressed himself mainly to watershed projects, advocated doing away entirely with the benefit-cost ratio, calling it impractical, inaccurate, and misleading. It was also stated that some balance in development among regions was needed and that the benefit-cost ratio should, therefore, not be the sole basis for choosing among projects.

The opposing viewpoint stressed the great demand for limited resources and the consequent need for a rational basis for choosing among competing projects. It stressed that this required a quantitative expression of project benefits and costs. It was also pointed out that economics has made considerable strides in analyzing social costs and social benefits, so that broader effects are not necessarily outside the framework of economic analysis. Some supporting this position noted that costs are tangible and generally viewed with suspicion the justification of projects which could not show a surplus of tangible benefits over costs.

Reimbursement.—The second main subject of discussion was that of reimbursement and cost-sharing. A number of participants pointed out that the question was one of more or less reimbursement from direct beneficiaries, rather than one of either complete self-liquidation or assumption of total costs by the taxpayer. However, different positions did develop. One group emphasized the need for further development of the Nation's water resources and the importance of preventing high reimbursement requirements from blocking this development. They stated that the substantial national benefits of water resource development justified assignment of a large part of the costs of these developments to the general taxpayer. They also pointed to the difficulty of identifying beneficiaries and changing existing patterns of cost-sharing.

A second group pointed to the abundance of sound water resource projects awaiting development and stressed the need for selecting the most economical means of accomplishing any given purpose. They noted that those receiving benefits from water resource projects should pay for them and stated that the project costs to be borne by the Federal Government should be clearly shown and

justified on the basis of national benefits. The importance of showing reimbursements and subsidies on the basis of present net worth was also pointed out by this group.

These differences in approach resulted in a number of differences with regard to specific reimbursement problems, the principal ones being:

1. Repayment period: One view was that costs assigned to direct beneficiaries should be repaid within 50 years. Repayments extended beyond this period would be very small in terms of their present net worth.

An opposing view was that 50 years is too short a period either for sound analysis or for repayment of projects which will benefit future generations.

2. General basis for reimbursement: One position was that reimbursement should be based on market values. Under this method cost allocations would be unnecessary.

An opposite position was that reimbursement should be based on costs.

3. Repayment of irrigation costs: One position was that the general taxpayer shoulders a large subsidy both under the interest component and under the Colibran formulae. The latter delays repayment of irrigation costs so long that the present worth of the repayment is minute. The cost of interest-free money must be justified on the basis of national benefits. Congress should be provided with all the facts regarding the national subsidy to irrigation.

An opposite position was that interest-free money is provided by legislation and needs no further justifications. Under the Colibran formula costs not repaid by irrigators are shouldered by power users and are not a drain on the general taxpayer.

4. Power rates: One position was that insofar as possible multiple-purpose development should be financed by power revenues.

An opposing position was that power should not be burdened with repaying the costs of other purposes and rates should be set only high enough to recover power costs.

5. Navigation and flood control: One view was that requirements for local contributions to the cost of these types of developments are based on outdated laws and should be raised.

An opposing view was that local interests are already contributors to the cost of some of these works. Caution should be exercised in raising present requirements.

Problems in applying economic analysis.—Discussion concluded with examination of some of the practical problems involved in economic evaluation of water resource development. The difficulties of choosing appropriate interest rates and making price projections were noted. The problem of secondary benefits also received attention. In was stated that secondary benefits, as defined by the Federal Interagency Subcommittee on Benefits and Costs, would be small or nonexistent in times of full employment. This elicited the comment that benefits other than the primary benefits described by the subcommittee were important regardless of the state of the economy, and that further research into the type of benefits which should be used in project justification was needed. On the other hand, strong skepticism was expressed about the validity of any analysis of secondary benefits.

The final subject discussed was the measurement of power benefits and the problem of comparability between the tax and interest costs of public and private power projects. Several persons supported the need for making cost comparisons between potential public projects and alternative private projects on a comparable basis.

Midcentury Conference on Resources for the Future

(Subject to further comment by this section's participants)

Section IV chairman, Evan Just; cochairman, John Vanderwilt; Robert H. Ramsey, rapporteur; Howard L. Waldron, rapporteur. December 4, 1953.

Domestic Problems for Use of Land (Revised Section Digest)

Main questions discussed:

A. Should tax changes be made to stimulate the domestic mining industry to more exploration and more efficient extraction? If so, how and to what extent?

B. What new steps should be taken, if any, toward developing and applying new technology in the mineral industry?

C. Does the claim-patent system, as it exists in the laws governing mining activities on public lands, need revision because of present abuses, administrative difficulties, or because of a need to encourage exploration, development, and the use of new techniques of discovery?

D. In what other ways, if any, should Government further mineral exploration and development?

The steering committee paper on which the discussion in section IV was based embraces the generally held concept that stimulation of domestic mineral exploration and development is necessary to build up the resources for the future on which our Nation's expanding needs and security requirements must depend.

The Chair asked at the outset of the first meeting of the full section whether anyone present had any objection to the steering committee paper or the philosophy on which it was based. There being no objection, the Chair proceeded to invite discussion on the questions.

Question A: The tax discussion was approached under the general consensus that, from a long-range viewpoint, the search for and development of new mines in the United States are not proceeding at a satisfactory rate in the public interest, and that steps are warranted to stimulate such activity.

The general desirability of tax modifications to stimulate activity was proposed as a basic assumption. No opposition was voiced. At the meeting on December 4 at which this digest of the proceedings of the section was reviewed, however, opposition to the use of tax measures as a stimulant to mining activity was voiced by one who had not been present during discussion of that subject.

The discussion then developed the following points:

1. Should the $75,000 limit on expensing of exploration costs be removed?

The group agreed that because of the steadily increasing cost of finding new ore reserves in the United States, the $75,000 limit on expensing of exploration costs should be removed. This step was regarded as one of the most effective means available of encouraging performance of the long-range exploration necessary to provide the mineral reserves of the future.

The group also considered the advisability of seeking to expense all preproduction costs in developing a mine. However, there was not concurrence proceeding in this direction, it being thought that the problem was too highly technical to be solved by those present.

2. Should revenue from a wasting-asset enterprise be given special tax treatment?

The group agreed, in principle, that revenue from production out of a wasting-asset enterprise, based on an orebody of uncertain extent, should not be considered as income until the investment has been recouped.

3. Should the depletion allowance be increased?

The group agreed that it saw no present need for increasing depletion allowances, although prevailing opinion held that the possibility of an altered viewpoint based on changed conditions should not be foreclosed.

It was stated as a special case that uranium production in the Colorado Plateau is being hampered by inadequate depletion allowances.

The viewpoint was generally expressed that depletion allowances are fundamental to proper tax treatment of mining as a wasting-asset industry.

4. Should the Canadian 3½-year exemption from income tax be applied to new United States mining enterprises?

The group approved the general idea of an initial period of tax exemption for new mining enterprises, such as exists in Canada, whether for 3½ years or for some longer period. It was suggested, however, that such a provision might entail greater administrative difficulties in the United States than in Canada.

5. Additional suggestions: It was further suggested that tax revision should eliminate the present requirement of disregarding percentage depletion in carrying over net loss from one tax year to another.

Also, it was suggested that mining stockholders should be granted the right to depletion allowances on dividends.

Summary: In conclusion, the viewpoint was expressed that, if all the tax measures discussed in the foregoing paragraph should be adopted, a strong impetus would be given to prospecting and development, and ultimate tax revenues to the Government would far outweigh any short-term loss.

However, the view was expressed that each measure of tax modification should be carefully studied by experts before being adopted.

Question B: In the field of earth science, well-organized research is being conducted. Discussion brought out, however, that an accelerated and enlarged research program is necessary to increase production for the future. In addi-

tion, the present basic program of geologic mapping should be carried forward at as high a rate as possible.

On means of accelerating research, the section indicated general approval of the recommendation of the President's Materials Policy Commission with respect to mineral exploration:

"That an intensive program of basic scientific research and technical development be undertaken on techniques and instruments of exploration for minerals. The first step should be the appointment of a special committee under the National Science Foundation, made up of outstanding experts from Government, private industry, and universities, to make a full inventory of existing scientific and technical knowledge and research projects in the field, to determine the areas of greatest need for further research and development, to revise a coordinated program to be carried out by private groups and such Federal agencies as the Bureau of Mines, Geological Survey, Bureau of Standards, and Office of Naval Research, and to estimate the cost of the program and the extent to which it will require supporting funds from the Government. The National Science Foundation could call upon the National Academy of Sciences (National Research Council) for assistance in laying the groundwork of a program." But it emphasized that specific mention be made of endowed research foundations, and also of State Geological Surveys.

Who should do the research? There was general agreement that it should be an all-fronts attack, among the several agencies named above and in the Paley report.

How should research be financed? Several felt that Government and private industry would support necessary research, properly planned for.

How should research of these many agencies be coordinated to get the greatest good per unit of effort? Here, the members felt it necessary to define coordination. It would include:

1. Compilation and cross-indexing of information, literature, and current research projects, and periodic issuance of a catalog of such information.
2. Promotion of a free interchange of information wherever possible.
3. Remaining sensitive to the research needs of industry, and suggesting important areas for research which are being neglected, and areas of investigation which should be expanded.
4. But not arbitrary supervision.

The National Science Foundation was suggested as the agency of coordination.

In summary, the section agreed that there is great need for increased basic research and technical development. This will require more trained research personnel, better long-range financing, and proper organizational arrangements.

Question C: There was general concurrence that the basic principles of the claim-patent system should be preserved, namely, encouragement to mine development by private enterprise and the right to acquire title by discovery and development.

1. Modifications of procedure

(*a*) Should the discovery requirements be abolished or changed? The view was generally expressed that favorable geological or geophysical evidence should satisfy discovery requirements.

(*b*) Should duplicate recording be practiced? The double recording of claims would require that a claimant register his mining claim in his local county seat as he does now, and that a similar record be sent also to the Bureau of Land Management. Most members of section IV thought that double recording would be desirable if the expense and effort for locator and Government were not too high. A simple suggested method for the locator would be mailing of a duplicate copy of his location notice to the Bureau of Land Management; this would not involve any additional surveys, legal descriptions, or work on the property. The low cost and efficacy of microfilming the county records was also pointed out. One participant felt that cost of keeping records by the Bureau would be amply repaid by the added information on its holdings; and also thought that such duplicate recording should be a requirement for maintaining the validity of a claim. The duplicate record would be for the purpose of record only and would not alter the legal priority (for purposes of property right) of the actual discovery and location of a claim.

(*c*) Should the requirement for assessment work be raised? On this point, opinion was that the amount of money was relatively unimportant and should thus not be changed. The important thing about the $100 annual assessment work per claim is that it is an act of good faith in prosecuting development.

(*d*) The next question was whether assessment work should be required. The group agreed that assessment work should be required, $100 per year per claim, except under truly extraordinary national conditions.

(*e*) If the locator fails to do assessment work, should he automatically forfeit his rights to the claim? It was felt that this should be further explored.

(*f*) Should evidence be required of the economic worth of mineral at time of patenting? The consensus here was that present practice is adequate based on the "prudent man" concept.

(*g*) Should a claim owner be dispossessed if his use of the claim is for other than mining purposes or uses reasonably incidental thereto? It was agreed that subterfuge use of mining claims should be treated as disreputable. However, the criteria for dispossession should be carefully considered.

2. Modifications in principle

(*a*) Would a change to larger mining claims with vertical boundaries be desirable? The consensus here was that no change should be made as regards lode claims and the existing principle of extralateral rights on these. But in the acquiring of claims by new methods, such as those resulting from prospecting by geophysical, geochemical means or by geological inference, a new principle was likely necessary.

(*b*) Multiple use of lands in the public domain involves intelligently shared use by various industries, such as mining of lode claims, mining of minerals under Government lease, petroleum, grazing, forestry, and others. The consensus here was that the Government should be allowed during the period of prepatent use to let other parties engage in multiple use so long as it does not "materially interfere with use for mining."

(*c*) What should be done to encourage new methods of prospecting? The section endorsed the spirit of the Geophysical Mining Claims Act of 1947 on which no action has yet been taken by Congress. This act would provide a new framework for new-method prospecting, which if successful would lead to title on the property. Hearings on such a bill would be necessary to determine economic specifics such as time requirements, size of claim. Members suggested that such a law provide for geophysical, geochemical prospecting, and prospecting done on the basis of geological inference. There might be two or more types of claims. One might cover prospecting in lands covered by soil or detritus. Another might be in hard rock in and near other lode claims; an example of this is in the Coeur d'Alene district of Idaho, where lode claims have been staked on the basis of favorable alteration and structure of surface rock; this is lode-mining country in hard rock, but valuable minerals are likely to be far below the earth's surface.

(*d*) Should leasing be extended, perhaps on an optional basis? The only positive expressions were in opposition to extension.

At several points during the session discussion centered around the proposed modification of the mining laws.

Also at several points during the session, some members expressed the belief that our basic mining law of 1872 should be restudied with a view to modernization. It was felt that the law needs revision to eliminate abuses, and to adapt it to modern practices and prospecting techniques. There was general agreement, however, that such a revision must not change the basic aims of the present statute.

Attention was called to the numerous decisions of the Department of the Interior and the courts interpreting the mining laws and to the importance of certainty in property law, and it was suggested that only necessary changes be made in the law as thus interpreted and understood.

There was a suggestion that public-land administrators should be authorized to invalidate an unpatented mining claim in an area where the values to the public in other resources which would be destroyed or seriously impaired by mining activity are found to be greater than the probable benefit to the public of the proposed mineral development. Discussion failed to produce any consensus on this suggestion.

In summary, section IV felt that: Basic principles of mining law have proven effective and should be retained; that abuses of the claim-patent system should be corrected; and that full assessment work should be performed; that the multiple-use principle on unpatented claims so long as such use does not materially interfere with mineral exploration, development, and mining should be endorsed; and that provision encouraging new methods of prospecting should be written into law.

Question D: In considering the question of what other ways, if any, the Government should further exploration, development, and production, the section first took up those forms of Government aid to industry which directly stimulate production. The discussion began on the subject of the tariff. It was understood, as stated in the section paper, that the conventional tariff would be viewed "vis-a-vis other means of Government stimulation of or aid to the mineral industries, in the sense that tariffs may be one of several devices used under an overall policy." The free trade versus protection issue of the tariff is, of course, the subject of another section of the Conference.

There was common agreement that the conventional tariff as a means of adequate aid to the mineral industry is no longer feasible under present national and international conditions. (The discussion therefore passed on to other alternatives.)

The device of import quotas was also dismissed from consideration by common consent as being administratively difficult regardless of its possible merits on principle.

The three remaining devices considered were the flexible tariff, direct subsidy, and Government purchase programs. There was no discussion of the flexible tariff as such in view of the common knowledge of its advantages and disadvantages, stemming from its current proposal by the lead-zinc mining industry as the immediate means of amelioriating that industry's present market difficulties.

Two new proposals were presented by subsection participants for consideration, one involving a combination subsidy and purchase program, the other a combination of tariff and subsidy. The former contemplated the determination of an economic price for a given metal, and Government payments to producers of one-half the difference between the economic price and any market price below this. The plan also contemplated purchase by the Government for permanent stockpiling of surplus production thus supported.

The second proposal involved the fixing of specific tariffs at a level roughly equal to 10 percent of a fair market price. The proceeds of the tariff would be remitted to domestic producers, prorated according to the output of each producer. The domestic industry would thus have both a certain amount of tariff protection and a subsidy, the size of the payments depending on the quantity of imports and the ratio between domestic production and imports.

After considerable discussion of the foregoing methods of possible Government aid to production by the domestic mining industry, no preference was established for any one over the others.

In the discussion of subsidy as a means of Government aid, it was noted by some that this device tends to create a need for production controls.

The subsection then considered Government financial aid in exploration for minerals. There was full agreement initially that exploration must be encouraged in order to provide for future needs of mineral raw materials. However, the preponderant view appeared to be that long-term Government financial aid to exploration such as that currently carried on by the Defense Minerals Exploration Administration is not desirable, with the exception of exploration for strategic minerals and aid to prospectors and small-mine operators.

On the subject of direct exploration activity by the Government, it was agreed that the aggressive policies followed in past periods of emergency have not been objectionable. It was further agreed that the Government should follow the principle of not competing with industry. Such activity, therefore, should be carried on only under special circumstances, and then with circumspection.

Midcentury Conference on Resources for the Future

(Subject to further comment by this section's participants.)

Section V: Chairman, Farrington Daniels; F. G. Fassett, rapporteur; C. J. Dwyer, rapporteur. December 4, 1953.

Energy Resource Problems (Revised Section Digest)

This paper, which undertakes to be a draft of the digest of the deliberations of section V as a section and of its subsections as well, is based principally upon the summary reports of the subsection rapporteurs, to whom acknowledgment is here made. The size of the section, and the importance of the topics which concerned it as a whole and in its subsection divisions, combine to make the problem of summarization an intricate one. Such success as this digest

may have in meeting that problem will be due to the acumen and attentiveness of the several rapporteurs who handled the arduous task of the subsection meetings.

Discussion of estimates of total energy supply, as broken down into estimates of resources of mineral fuels especially, with passing attention to water power and synthetic fuels, opened the first and plenary session of section V, December 2. The necessity for reduction of terminology to a common basis, and for clear differentiation among so-called ultimate, inferred and effective or proved reserves was stressed. It was clear that economics continues to be a major determinant; the investigation and investment necessary to find new reserves of petroleum and to bring a large portion of already discovered reserves of coal and oil shale into commercial production must wait on the economic possibility of paying the bills involved. Development of the vast stores of power in unconventional sources such as nuclear and solar energy is of course subject to this limitation. The interplay of economics and technology suggested here was stressed in later discussions; it appeared that the problem was that of balancing the desire to freeze a situation for economic reasons against the knowledge that technological advances yet to come could and would readily upset the freezing situation.

Thus consideration of ways to speed exploration and greater production of mineral fuels—to which the section next moved—brought vigorous comment on the adequacy of present rewards for such exploration. The interrelationship of economic forces involved was suggested in the statement that oil companies can neither lower prices nor raise dividends unless means are found to reduce the capital required for development of new units of production.

SUBSECTION A—UNCONVENTIONAL SOURCES OF ENERGY

Subsection A, concerned with unconventional sources of energy, in its meeting of Thursday morning, December 3, centered discussion around the question: "What are the potentialities of atomic energy as a major source of electric power within the next 20 years?"

All reactors have a characteristic of generating a certain amount of fissionable fuel for each unit of fissionable power consumed. Where the nuclear fuel generated is an amount less than 1 unit for each unit of U–235, PU–239, or U–233 consumed, the reactor is viewed as a converter reactor. When, however, one or more units of nuclear fuel are generated for each unit of fuel consumed, we generally consider the reactor to be a breeder reactor. It will be noted, therefore, that there is no sharp dividing line between reactors which produce some fuel during their operations and reactors which do not.

Whether the entire stock of natural uranium and thorium shall be utilized is a question in which military demands have a major part to play at present. There are cost and technology differences depending upon whether a reactor is a single-purpose one concerned with making power without the removal of plutonium for military stockpiles, or whether it is a dual-purpose reactor which will generate power at the same time that plutonium (in the case of transmutation of uranium 238) is abstracted periodically from the reactor. In one efficiency sense the single-purpose reactor concerned only with making power is a more economical power producer than the dual-purpose reactor concerned with making plutonium for renewal as well as power.

In summary, the meeting agreed that from the standpoint of eventually having available as fission fuel all natural uranium and thorium, this result could be achieved by various routes and conservationists need not be concerned about the route so far as this single question is concerned. However, costs may differ substantially depending upon the routes, and economic efficiency in the utilization of natural, manmade, and human resources is the major conservation purpose. We shall not be able to establish this direction of greatest economic efficiency adequately until the Government permits reactors whose purpose is power alone, in addition to dual-purpose reactors of various kinds.

One estimate was put forward at the meeting that if economic recoverability is defined as being 2 or 3 times present definitions of economic recoverability (i. e., if recoverability is defined as $100 per pound of uranium) there are perhaps 25 million tons of natural uranium available to the world. If only the U–235 in such uranium could be utilized as fuel in nuclear-power reactors, this resource would be equivalent to only about one-seventh of the fossil-fuel reserves of the world. Since, however, as pointed out above, all uranium is ultimately usable as fission fuel, the above-mentioned natural resource is equivalent to about 20 times the world's energy reserve of fossil fuels.

Several other factors modify the above rough indication of fission-fuel reserves, all of them in an upward direction. First, thorium (as noted earlier, having the same fission-fuel potentialities as uranium 238) is available in very large quantities; less is known about these reserves and at the moment we do not know if they are greater than or lesser than uranium reserves. Second, the definition of recoverability, above, misses a very large volume of uranium and thorium reserves, and the utilization of lesser cutoff points would increase the reserve estimates enormously. Lesser cutoff points would be justified both in terms of need of access to such reserves and for the reason that technological advance can be expected to constantly bring submarginal reserve into the category of economically recoverable with the passage of time.

The meeting considered possible costs of nuclear electric power in the United States for the year 1975 and considered the volume of electric power which might be passed on fission fuels at that time. There seemed to be a rough kind of agreement that the year 1975 would find nuclear power and incremental thermal power costing much the same at locations not too distant from coal resources. But there was a difference of opinion as to the volume of electric power which could be or might be derived from fission fuels at that date 20 years distant. The rough estimate was put forward that the increase in kilowatt-hours of production in the United States at that time over present levels might be 1,000 billion kilowatt-hours, equivalent to perhaps 150 million kilowatts. There is plenty of room for several tens of millions of kilowatt-hours based on nuclear power for such a market forecast. The basic question is, "How fast will the nuclear-power industry, whose present costs of electric power generated are estimated at twice thte available levels of thermal power costs, reduce costs and how fast would actual investment be in nuclear power?" A goodly number of people believed that the emergence of nuclear power would be quite slow and that the fraction of electric-power demand satisfied by nuclear sources 20 years from now was not likely to be as high as 10 to 30 percent. Others believed that these fractions might be achieved.

There are two positions taken, of course, with reference to the problem of Government control. One group holds that the United States Government should continue to own and in the future operate all atomic energy installations. The other group holds that progress in the field of atomic power for mass distribution can only result from large-scale private enterprise in this field. Both groups agree that at the very outset of the atomic energy program during and shortly after World War II the Government was the logical producer.

There are those who hold that should the Government allow private patents in the field of atomic energy the Government should be certain to guarantee that the licensing and royalty setup would not be a future instrument of monopolistic control. The AEC has been considering the sort of licensing and royalty clauses which could possibly be made a part of a private patent system. The industry has tended to view with disfavor such a Government organization as the Patent Compensation Board. It is held that there is no logical method for discounting the future value of any patent. The exclusive Government dominion in this area is possibly exerting baleful influence on the types of power reactors that are being built and in the variety of reactors which are being experimented with.

Question was raised whether, in view of the apparently substantial advance in the Soviet Union on atomic-energy matters, as well as in other countries, secrecy could not be relaxed for those phases of the atomic-energy program which are involved in atomic electric power generation.

In spite of the fact that there are at present a limited number of reactor types it is felt that an important area of research lies in the direction of more and diverse reactors. The AEC should continue to encourage designs of different types of reactors. Insofar as the number is concerned this is a function at the present time of various congressional appropriation groups. It should be made clear that as more reactors are constructed the economic data pertaining to costs expand, experience with the raw materials connected with reactors expand, and the probability of lowering the costs of production of atomic energy become increasingly better.

There are several unique characteristics of atomic energy which make it more desirable for uses where up until the present the fossil fuels have been utilized. The fact that this form of energy can be used without calling upon oxygen makes it exceptionally desirable in energy utilized in submarines. This form of energy is also highly desirable where high temperature research is involved. By use of

this form of energy various minerals can be increasingly utilized; e. g., molybdenum. There is also the rather interesting point concerning interaction between atomic energy power and fossil fuel. Coal and petroleum are viewed as fuels only because we use them as fuels. Coal and petroleum could increasingly be utilized solely for the production of chemicals if atomic energy became a source of power. Atomic power could also effect a change in our pattern of energy distribution, because small amounts of fissionable material could be moved great distances with considerably more ease and economy than can such fuels as petroleum, natural gas, and coal.

Solar energy

The afternoon session devoted to solar energy and other unconventional, nonatomic energy, opened with emphasis on the fact that solar energy was a high potential but dilute source and gave, as substantially limiting figures on solar energy reception Boston and San Juan, 390,000 and 710,000 B. t. u. per square foot per year respectively. This is equivalent to 2.8 and 5 gallons of fuel oil.

The flat-plate collector was presented as a device in advanced stage of engineering development, capable of producing a thermal efficiency of 30 to 60 percent for water heating or for heating domestic dwellings.

With respect to the photo cell, there has recently been developed a silicon cell capable of producing 4 percent useful conversion of incident sunlight to electric energy.

Concerning flat-plate collectors for power there is a divergence of opinion of efficiencies achieved, which, however, are bracketed by 4½ and 8½ percent. In one set of calculations the cost of electric power in several different countries of the world was compared by showing those costs of flat-plate collector construction per square meter which are equivalent to local fuel costs per kilowatt-hour. The figures were as follows:

	Collector cost per square meter	Fuel cost per kilowatt hour
Queensland, Australia	$7.50	$0.0085
Japan	14.50	.0140
United States	3.00	.0034

Calculations made in a somewhat different manner for the El Paso area of the United States indicate 8½ percent efficiency, 15 kilowatt-hours per year from 1 square foot of collector, and equivalent costs of about $0.007 to $0.015 per kilowatt-hour for collectors costing $10 to $20 per square meter.

Thermocouples in flat-plate have been achieved to yield up to 1 percent efficiencies.

Parabolic collectors have been developed to the point of yielding 12 to 15 percent efficiencies in the form of electric power from solar engines.

Turning now to devices which are in an early research stage there are the following: (1) Photo chemistry—there have been some recent interesting experiments involving the decomposition of water with solar energy, using cerium ions in two stages of oxidation. (2) Storage—experimental work has included specific heat effects in water tanks, and crushed rockbeds, and phase changes in salt systems.

For comparison of the above efficiencies with efficiencies in nature, hybrid corn and Hawaiian cane use the sun's energy with an annual average efficiency of ⅓ and 1½ percent, respectively; algae have been grown, in pilot-plant operation, with an efficiency of 1 percent.

Research should be pursued in many directions. Flat-plate collector performance can be improved by surface treatment of glass and by development of cheaper and better fabrication and assembly techniques. Thermal storage research engineering economic studies should be pursued with adequate allowance for variability of weather. Further photochemical and photoelectrical research is indicated. Summer-season use of collector units for airconditioning purposes would enable more even load factors.

The general feeling as to the nature of the research efforts was that they should be small projects of a fundamental research nature rather than large-scale pilot-plant constructions, that in contrast to atomic-power development there is not a present need for large-scale experiments to evaluate the economic possibilities

of any proposal for solar-energy utilization. House heating was an exception; full-scale experiments are necessary and, fortunately, not costly.

It appears that solar energy will not comprise a major source of energy in the United States for many years. On the other hand, power from solar energy is not many times more expensive than energy from fossil fuels at the present day and as expected within the next generation. Certain minor applications in favorable climatic situations will certainly occur and expand during the next 20 years, especially in the areas of water heating, house heating, and other low-temperature energy applications. There may even be certain electric power applications in some parts of the world.

While solar energy does not presently promise to replace conventional fuels in any significant sense, it does provide insurance for some future time when fossil fuel costs rise because the upper limit on energy costs provided by solar energy indicates that when this day arrives no overwhelming cultural change will be necessary to adapt to it. Unfortunately, there do not seem to be great opportunities for drastic reductions in costs as there are, no doubt, for atomic energy. But small unit applications will take place, and widespread unclassified research should be conducted upon many small projects. Much of this research will no doubt be financed by private companies who may be interested in solar units as outlets for their material, and several private foundations will no doubt continue their generosity toward research in this area.

There seems to be no striking role for Government research funds to play in the pursuit of solar energy. On the other hand, there appears to be a striking disparity between expenditures of the Government in research on other energy sources as well as substantial direct and indirect assistance in production of these fuels, whereas there is only insignificant expenditure by the Government on solar research. Views were expressed to the effect that the Government should assist research on solar energy.

Wind energy and earth heat

For more than a decade there has been research conducted in Vermont at Grandfather's Knob upon a thousand-kilowatt windmill. In the last several years aerodynamic improvements have been utilized and a 550-foot tower raised to give substantially better results.

A more ambitious project is that of Percy Thomas whose projected windmill was designed to achieve 7500 kilowatt capacity and would cost around a million and a half dollars. Thomas based his design on several elements which he believed would make his system competitive with steam energy even if he was considerably in error in some of his calculations. He emphasized the fact that average winds from year to year are extremely constant practically everywhere although they are quite variable from day to day. Thus, there is no major seasonal variation for this natural fuel source, and it might be used effectively to supplement other variable energy sources. The view was presented that Government support for such a pilot plant might be necessary because of difficulties in protecting the improvements involved by patents.

A 2,000-kilowatt windmill has apparently been designed in Algiers which indicates substantial promise because of steadiness of the wind at the location.

Earth heat grids apparently will deplete local temperature gradients so rapidly that very large and obviously uneconomic surface areas of collection would be necessary. It is possible that natural faults might be utilized to yield much more efficient drainage of earth heat if we can learn how to find them and tap them by drilling. This kind of geophysical exploration has not yet been done and might be fruitful.

SUBSECTION B—ELECTRICITY AND SYNTHETIC FUELS

In its morning session on electric power, subsection B heard widely differing opinions on the respective roles of Federal, local, and private utility interests in electric power supply, but also strong arguments for growing cooperation among them in the best interests of all the people.

The underlying factors affecting the various views included: The marked differences among regions in availability and economy of various power sources, the rather limited extent to which hydropower will ever be able to share in meeting total electric power demands, the multipurpose character of large dams and the value of diversity in ideas and in approaches to the solution of problem of such national importance as electric power supply, the very rapid growth in demands and in necessary capital investments, the undesirability of the Federal

Treasury's shouldering the major part of such necessary capital requirements, and the importance of coordination in interconnected system operations and in technological development irrespective of differences in ownership.

Among the various views expressed was the feeling that non-Federal agencies should be encouraged to do first everything they can in the field of resources development such as construction of generating plants, transmission lines, etc. Local communities should be free to decide their own local power policy without coercion. The Federal Government should not do what non-Federal agencies are able and willing to do and should not enter the picture in competition with them.

In discussion of recent technical improvements in long-distance transmission of large blocks of electric power, it was brought out that in the last 10 years the Bonneville Power Administration has increased circuit loading from 90,000 kilowatts at 230,000 volts to 180,000 kilowatts at that voltage and a prospective 500,000 kilowatts at 345,000 volts. This will result in a considerable decrease in transmission costs, estimated to amount to approximately 30 percent per kilowatt-hour for energy and approximately 30 percent decrease in the cost of capacity. A similar economy in energy transmission in other parts of the country contrasted with the increased cost of moving coal, could well result in more generating plants being built adjacent to the coal mines than is now the practice. However, a similar economy in energy transmission in the north central industrial area of the country, combined with the low costs of moving coal by barge on the canalized rivers, has resulted in greater opportunities for locating power stations at river sites more strategically located to the load rather than at mine-mouth locations, which has been the general practice.

The industry is generally agreed that there will be a great increase in the use of electric air-conditioning and air-heating for homes. The result, even now, is that some systems which formerly had peak demands in the wintertime now experience their greatest loads in summer.

It was agreed that it should be the policy of the Federal Government to encourage the fullest participation of private power companies in hydroelectric projects. The policy of river basin developments wholly by Federal agencies should be reexamined and the feasibility of private and public cooperative arrangements should be explored. To the maximum extent feasible, coordination between publicly owned and privately owned utilities should begin before projects are built in order to improve the utilization of power from all private and public suppliers.

The experiences in the State of Arizona were cited as an example of cooperation among private interests and Federal and local governments.

Synthetic fuels

When it considered the development of synthetic fuels, at its afternoon session December 3, subsection B heard three reasons for the maintenance of research in this field: (1) United States has become an importer of oil rather than an exporter, (2) the cost of finding oil is increasing, (3) we have vast resources of other materials suitable for liquid fuel. These are oil shale, coal, tar sands, and agricultural products.

Continuation of research in synthetic liquid fuels by the Bureau of Mines, as well as by the oil industry, was generally supported.

It was agreed that more effective and impartial evaluation of Government research in synthetic liquid fuels was needed. It was suggested that impartial technical research advisory committees might be used to insure that efforts in synthetic fuels were properly evaluated. Some speakers regretted the action of the last session of the House of Representatives, when 90 percent of funds for the Bureau of Mines' synthetic liquid fuels program was cut. Others, however, expressed strong opposition to the Bureau's program as originally planned.

The importance of new ideas in the field of synthetic liquid fuels research was stressed. The German coal hydrogenation (Bergius) method has been known since 1913. There is a need and an opportunity for new ideas that will change the process materially and make the production of synthetic liquid fuels more economical. For example, the new Pelipetz process might reduce the installation and operating cost of producing liquid fuels from coal by approximately 10 to 15 percent. We need more new ideas like this. Some participants declared, however, that at the present state of knowledge, hydrogenation of coal to produce liquid fuels appears to be considerably less attractive than production of oil from shale or other methods of converting coal to oil.

Regardless of whether the production of synthetic liquid fuels has commercial applicability today, it was declared, someday we are going to have to rely on it.

The Federal Government has spent more than $70 million on this research program, which has been going on upon a fairly large scale since 1944, and on a smaller scale for at least 10 years previously. It was agreed that during that time, the Government has built up a highly capable organization, although some felt it should be utilized on continued pilot-plant operation rather than on demonstration scale plants.

SUBSECTION C—CONSERVATION AND USE

In the work of subsection C, it was recognized at the outset that conservation is one of the most controversial of subjects and that it does not mean nonuse of resources. Conversion of energy resources to power was seen as generally more efficient in the United States than abroad. Conservation of energy resources in connection with motorcars was taken as illustrative of some of the problems involved. It is partly a matter of fuel and equipment to consume fuel but also includes such factors as the size and speed of the vehicle that reflects on the standard of service, and ultimately is a problem of costs.

The discussion developed the point that production of higher quality gasoline, notably from the standpoint of octane rating, has been instrumental in conserving this fuel by making more efficient motors possible. Although the consumption of gasoline has increased rapidly in recent years, the number of ton-miles of transportation provided by each gallon consumed has also increased. Estimates placed the gain as much as 50 percent, and it was pointed out that substantial additional gains are in sight. This gain might be considered to be equally as significant as an increase in the available reserves.

With respect to petroleum generally, it was pointed out that high-quality fuels are being produced with smaller thermal losses than existed several decades ago. Petroleum refineries require less fuel for their operation in relation to output even though they are producing higher grade products and the improvements have been substantial. Thermal cracking, for example, doubled the yield of gasoline and catalytic cracking increased the yield to an even larger extent.

Considerable interest was expressed by the group in the use of electrically driven vehicles to conserve gasoline. It was generally felt that this type of transportation would need to be highly efficient to compete with motor cars. Unfortunately, commuting service by electrically driven vehicles has been declining in quality. It was felt that special service at special fares might be required and believed that the public would be willing to pay the price. In the succeeding discussion of the group, however, it was contended that deluxe service has not generally been successful.

Repeatedly during the discussion it was shown that conservation of energy resources is related to prices and costs. Representatives from both the coal and petroleum industries stated that higher percentages of extraction could be achieved at higher prices. The fuels were regarded as being highly competitive with each other. The principal competition of coal is with residual fuel oil and natural gas. Electric space heating as a conservation measure was discussed at length. The view was expressed that we are progressing only slowly toward this type of use and that it is not being encouraged intensively by electric power companies because of a probable adverse effect on their load factors. This disadvantage might be overcome by the storage of heat at least to meet daily variations in the load. The general use of electric power for space heating, it was felt, will not occur until the price of gas is much higher than at the present time.

A topic of special interest was the conservation of low-level heat. Although some attempts have been made by power companies to use low-level heat for space heating, the field is still largely untouched. Attention was called to the free-piston engine as a possible means of using low-level energy. The efficiency of this machine is reported to be capable of going as high as 50 percent. One of the problems in the use of low heat is the limitation of available water supply.

It should not be concluded that conservation will necessarily reduce the consumption of fuels. Although the efficiency with which fuel is used is an important factor in extending reserves, experience has shown repeatedly that the higher the efficiency in use the higher the consumption is likely to become. Some participants felt, however, that this confused efficiency with conservation.

One of the questions placed before the group was whether the control of end-use of fuels would serve the national interest. There was a difference of opinion on this point. Considerable difficulty was encountered in defining the grade of use. One partial solution was simply the proposition that it is undesirable to

use a relatively scarce fuel in replaceable uses at the expense of uses for which it is peculiarly adapted.

At numerous points the discussion dealt with the competition between petroleum, natural gas, and coal, and the bearing that this competition has on conservation. Some hope was foreseen for a larger use of coal resulting from the application of new processes, such as the fluid coking process, which will make larger conversion of residual fuel oil to light products a more profitable venture.

The effect of certain industry operations on conservation was discussed briefly. It was pointed out that one of the primary uses for natural gas is in the repressuring petroleum reservoirs with the result that ultimate recovery is increased. Underground gasification of coal also was mentioned as a conservation measure. Importation of petroleum also was discussed from the standpoint of its effects on conservation.

In the field of nonfuel uses of energy resources it was pointed out that these consume only a small percentage of the energy resources. Some felt that eventually most of the oil and gas would be used for nonfuel purposes. Opinions as to when this would occur ranged from within our lifetime to many years in the future.

The final meeting of the entire section was devoted to questions of broader policy in the conservation and utilization of energy resources. The point was strongly made that in any evaluation of resources the great potential in terms of technology must not be overlooked. The tendency to evaluate resources in terms of present uses and demand projected into the future neglects this great potential, it was said. Technology, it was held, can increase recovery of energy resources, increase the efficiency of the conversion of energy resources to useful work, make new sources of energy available, and modify the pattern of demand for various forms of energy. One of our greatest resources, it was maintained, is an expanding and flexible technology.

Pointing out that the technologists in the energy field already are gaining much from exchange of ideas, several participants wound up the discussion of cooperative approaches to solutions of energy resource problems by stressing the importance for the future of getting energy information out of the libraries and on to the floors of forums.

Midcentury Conference on Resources for the Future

(Subject to further comment by this section's participants)

Section VI chairman; Edward S. Mason; John W. Evans, rapporteur. December 4, 1953.

United States Concern With World Resources (Revised Section Digest)

The task assigned to section VI of the conference was an examination of the United States concern with world resources. At the opening session of the section, the group accepted the recommendations of the section steering committee and the chairman regarding certain limitations in subject matter. These were in some respects arbitrary but were primarily designed to confine the discussion to those aspects of international raw material problems that are most pertinent to the work of the conference as a whole. It was agreed, in the first place, to attempt to consider world resources primarily from the viewpoint of the United States. While there was no intent to minimize the interests of the United States in broader world problems, it was nevertheless felt that those interests that related to supplies for the use of our own economy should receive the greatest, although not the exclusive, attention of the group.

Perhaps more arbitrary was the decision to omit foodstuffs from detailed consideration. To some extent, this decision was based upon the conviction that a discussion of foodstuffs would inevitably involve prolonged attention to problems which, though important from the point of view of foreign policy, are primarily domestic.

The entire section also agreed to the principal subjects selected for attention by the three subsections: commercial policy, economic development and price stabilization. Although national security was a topic of extreme concern, they felt that an attempt to deal with it separately would be impossible. However, it was bound to be one of the important considerations of each of the three subsections.

BASIC PREMISES

Section VI, in general, made no effort to arrive at definitive conclusions on the more detailed issues it had to deal with. At the same time, the extremely close interrelationship, and even overlapping, of the material of its subsections did require agreement on certain general premises. The first of these related to the part that should be played by considerations of availability in time of war in the determination of national policy. There was no dissent from the view that our calculations must take into account the possibility of war. The necessity of taking prudent precautions against this possibility necessarily enters into the determination of all of our policies but is particularly pertinent to the international area. On the other hand, there was no disposition to suggest that national security in this narrow sense, although necessarily of paramount importance, should be our only concern. The economic strength of the United States and of friendly countries, the importance of our role of world leadership, the objective of avoiding unnecessary hardship to American producers, to American consuming industries or to foreign producers and foreign consumers, all must be weighed in the scale. Indeed, these elements are themselves factors in our national security in its broadest sense and play a vital role in our ability to survive a war should one eventuate.

One aspect of the problem of national security that influenced the consideration of many issues was the changing character of warfare itself. It was explicitly recognized by the Section that some of the procedures of stockpiling against the risk of the interruption of supplies from abroad may have become outmoded by atomic warfare. The possibility that domestic raw material production, or the facilities for fabricating raw materials in this country, might be as vulnerable as shipping lanes, gave rise to serious questions as to the role of stockpiling and, in turn, influenced the consideration of commercial policy and investment policy particularly.

A common problem that was experienced in dealing with almost every issue before the Section was that of the time period which should be considered. It was pointed out at the opening session that a policy best designed to meet the problems of the next 5 or 10 years might be quite the wrong one if our sights are raised to a more distant objective. There appeared to be general agreement in this connection that the principal task before the conference was to explore alternative policies for the longer term—to take seriously the implications in the title "Resources for the Future." On the other hand, the short term cannot be ignored. We must recognize that, whatever the longer term outlook of the United States for raw material supplies 50 years from now, there may in the interm be more or less violent oscillations between surplus and shortage. They can seriously affect the strength of American industry. They can affect both the volume and the direction of American and foreign investment in natural resources. And they can have a very direct effect on our foreign relations. In consequence, they can have a direct and immediate bearing on our national security. On the other hand, there is not necessarily a conflict between short- and long-term policy provided that the latter is so devised as to avoid intensifying the short-term problems known to exist.

What are the prospects for adequate supplies to meet the needs of the American economy over the longer term—particularly supplies of those commodities entering largely into world trade? On this question there were wide differences of opinion in detail. But the area of agreement was sufficient to make it possible to discuss most issues on common grounds. There was general acceptance of the forecasts of the Paley Commission. While the specific projections of the Commission were challenged in certain respects, it was agreed that policy should be based on the assumption that, over the longer run, American industrial production will continue to grow, our consumption of raw materials will grow comparably though at a somewhat lesser rate than the gross national product, and our dependence on imports for the supply of most extractive raw materials will continue to increase, despite the fact that the United States will continue to be the most important raw materials producer.

Another basic premise generally accepted by the Section was the overwhelming importance of the United States as the world's largest consumer of all of the materials under consideration and the resulting impact on the rest of the world of actions taken by our Government. In some cases, a decision of relatively small immediate importance to the United States can have a vital impact on the economy of a friendly foreign country largely dependent upon the production or upon the export of the commodity in question. The problem of how

the United States can reconcile its own direct interests with its world responsibility created by this condition was a live one in the discussion of many issues.

The following three subsection reports represent the more detailed discussion of specific issues as they took place in the subsections themselves. Their review by the full section did not permit amendment to cover additional views that were not expressed in the subsection meetings, therefore, they cannot necessarily be taken to represent the views of all those who participated in section VI.

SUBSECTION A—SUMMARY, COMMERCIAL POLICY

John Lindeman, rapporteur; Mary Jane Heyl, rapporteur; chairman, Stacy May.

I

The subsection noted that its job as defined would be limited to discussing United States commercial policy (specifically tariffs and other measures designed to limit imports) as such policy affects the availability of raw materials, and in terms of what we consider to be the United States interest. It was noted further that raw materials would be defined as minerals, fuels, forest products, and agricultural products other than foodstuffs. It was further noted that the concept of the United States interest was itself complex. It comprises a variety of factors, among which are (*a*) the economic, political, and strategic policies of the Government, (*b*) the often conflicting interests of minority and majority citizen groups, (*c*) those interests of friendly foreign nations which are also important to the United States, and (*d*) the sometimes conflicting demands of short-term considerations over long-term considerations. In all of the subsection's discussions, there must always be in mind the necessity to balance these various aspects of the national interest.

II

The subsection then turned its attention to the materials requirements outlook, since an appraisal of what we face in this field was deemed basic to consideration of what kind of a commercial policy would be appropriate. The following premises were set forth by the chairman for discussion:

(*a*) That over the years ahead there would be greatly increasing materials needs to support the hoped-for levels of economic activity. The increase to 1975–80 would be of the order of 60 percent (over 1950) for all raw materials, and of the order of 90 to 100 percent for metals.

(*b*) There would be an increasing dependence on imports; imports of all raw materials would rise from the present 10 percent of consumption to about 20 percent; imports of metals would rise from their present 35 to 40 percent of consumption to about 55 percent.

(*c*) That the major likely source for the increased imports would be those geographic areas now roughly considered to be economically underdeveloped.

(*d*) It was noted that since June 1950 output of durable goods had increased 30 percent, while output of minerals increased 10 percent. The question was raised whether, if there should be a shift away from the heavy incidence of defense-type goods that presently prevails, we might not return to the situation of materials shortage that persisted from World War II until 1953. This likelihood was premised upon evidence that military production, with its high degree of fabrication, consumes far less materials per dollar of output than a comparable level of civilian production.

These premises were accepted by the participants as a reasonable basis for discussion, but several qualifications were noted:

(*a*) They were, in fact, premises. While they could be taken as a plausible definition of needs if our accepted aim (of maintaining the dynamism of the American economy) were to be achieved, they should not be accepted as ultimate truths. If they were, there would be a danger of forming policies in too rigid a framework, with potentially disastrous results if the premises turned out to be wrong. It would be desirable to maintain flexibility.

(*b*) The premise with respect to the relatively heavier demands of civilian output for raw materials, particularly copper, lead, and zinc, was questioned by some members of the group; and it was pointed out that if this opposite view were correct the United States might very well revert to a pattern of less dependence on foreign imports of these materials such as that which existed prior to World War II. It was pointed out that military expenditures in the current period accounts for perhaps 25 percent of our durable-goods production.

(c) With respect to the metals, it was further suggested that there was at least a good possibility that new geological and other methods of exploration will be devised within the next 25 years that will facilitate discovery of concealed ore bodies or that techniques will be developed to make possible the economic processing of ores that are now uneconomic. Such developments might greatly lessen our dependence on foreign sources of supply.

III

The implications of this outlook clearly call for a commercial policy that is of a kind that is generally encouraging to increased output and that is not unduly restrictive to needed imports. Upon examination, the characteristics of present United States commercial policy in the limited field of its application to materials imports were found to be in general accord with this definition. Although a number of deviations were noted, the following list of descriptive characteristics seemed applicable to our current treatment of materials imports:

(a) There is generally a liberal tariff policy with respect to raw materials.

(b) There is a large free list.

(c) With some exceptions, tariff rates are low and far from unsurmountable.

(d) Existing quotas are generally not important.

(e) The Buy American Act is not very important in the field of primary metals.

(f) However, there may be a deterrent effect because of the apprehension that the escape-clause and the peril-point provisions may be invoked.

(g) Present commercial policy is more restrictive with respect to the importation of partially processed materials, and to an important degree this discounts the benefit of more liberal policies with respect to primary materials.

IV

The group then turned its attention to certain limitations in United States current commercial policy that indicate the need for change. Suggestions along such lines as the following were made by one or more participants.

(a) It was suggested that revisions might be in order to give more positive encouragement to new raw material production abroad through:

(1) Liberalization of escape-clause and peril-point provisions.

(2) Reduction of tariffs on materials which have gone through a secondary processing.

(3) Reduction of tariff rates in cases where present restrictions tend to encourage substitutions, rather than offering effective protection to American domestic production in the field to which they apply.

(4) Reduction of tariff rates on items where no substantial United States interest seems to be in need of protection, as exemplified by nickel at one extreme, molybdenum at the other.

(b) On the other hand, there were a number of suggestions designed to have the effect of increasing materials output in the United States through offering more protection. These suggestions were made in the course of a review that occupied most of the afternoon session, in which attention was given to cases of particular commodities where current commercial policy is alleged to be unduly damaging to domestic interests.

The specific cases covered in this discusssion were:

(1) Petroleum, with particular emphasis on crude oil and residual fuel oil—notice was taken of the claims for additional protection on the part of coal producers and nonimporting oil producers, and of the position taken by major producers, that are likewise importers, that no change is warranted.

(2) Copper, lead, and zinc—for which representatives of United States producers presented their industries' arguments for the need of substantially more protection than is presently afforded by present tariff regulations. Arguments in refutation were also given by other members of the group.

(3) Long-staple cotton and wool—a briefer review of problems was stated.

V

An attempt was made to summarize the implications of the morning and afternoon discussions of this subsection, without any effort to tally numbers on one side or the other of an issue:

(a) The materials outlook is one that warrants a generally liberal commercial policy on the part of the United States with respect to materials;

(*b*) The current commerical policy in this field generally fulfills this specification and has moved progressively in this direction;

(*c*) The members of the group who had suggested the need for a less liberal policy with respect to certain materials generally based their contentions upon specific hardships that were claimed to be unduly damaging both to their industry interests and to the security interests of the United States. Some members pointed out that if effective methods of mitigating damage and hardship could be found, a more restrictive commercial policy might not need to be considered. This suggestion was not discussed, on the grounds that the subject was to be considered within the purview of section IV.

None of them had suggested a need for a general reversal in direction of the current liberal policy with respect to the whole field.

As the meeting was about to adjourn, the adequacy of this summation was questioned by one member of the group. He stated that, in his opinion, consideration should be given to the possible need for a general tightening of protective measures with respect to critical materials of high strategic importance for which there is a substantial present or potential production in the United States. There was no time for extended discussion of this suggestion but several members of the group seemed to be sympathetic with this position. However, it was pointed out by a member of the group that this position did not emerge from the discussion that had taken place in the two sessions.

It was generally recognized that the shortage of time had prevented discussion of many other commercial-policy issues.

SUBSECTION B—SUMMARY, INVESTMENT AND DEVELOPMENT

William B. Gates, Jr., rapporteur; E. Edward Scoll, rapporteur; chairman, H. DeWitt Smith.

The topic of discussion for this subsection was: "What are the most effective means by which an adequate rate of development of resources abroad can be assured, assuming that the consumption requirements projected in the President's Materials Policy Report are correct in general trend?"

There was general agreement that the basic task of developing adequate sources of mineral and oil resources abroad must necessarily be assumed by private enterprise. Some strongly expressed the view that the record of private accomplishment to date has been excellent. There was a feeling among many participants that the role of Government finance in developing mineral resources should be limited to expenditures for technical assistance in the field of geological surveys, and loans to private United States and foreign enterprise in those cases where it is clearly established that United States defense and related interests demand a more rapid rate of development than could be expected through normal private financing. Some felt that it might also prove necessary to draw on public investment in specific cases where basic facilities to service mining ventures, such as ports, transportation, and power, are lacking. Still others felt that a necessary prerequisite to adequate development of mineral resources was the general economic development of the countries concerned and that, in the interest of resource development, therefore, public financing of general economic development, including education and public health, is required. There was also mentioned, as an appropriate role for the United States Government, the revision of United States tax laws.

A number of areas of disagreement emerged from the sessions, only one of which appeared to be basic and strongly held. This was the question of how fully we could depend upon successful private investment in the petroleum and mineral fields (unaided by United States private and governmental investment in other fields) to satisfy reasonable expectations, in the underdeveloped areas, of rising standards of living through general economic development. It was the strong feeling among many participants that dependence on investment for extractive industries alone would not satisfy such expectations and might ultimately result in United States exclusion from certain sources of raw materials. Others took an equally strong opposite position.

Other areas of disagreement were the following:

1. In discussing obstacles to United States private investment in underdeveloped countries, there was the feeling among some participants that the first requisite was a strong policy on the part of the United States Department of State to induce conformity by foreign governments to reasonable standards. Such a view was opposed equally forcibly by those who felt that the United

States must proceed cautiously and tactfully to build up lasting friendships abroad for reasons of moral principle as well as self-preservation.

2. There was some disagreement as to the effectiveness of commercial and investment treaties in fostering United States investment abroad, particularly in the extractive field.

3. There was disagreement as to whether even the removal of the usual list of obstacles to United States investment abroad would substantially increase the flow of capital to underdeveloped areas in light of usually low returns as compared with better-equipped areas of the world.

The points of discussion

1. To what extent will increased demand automatically call forth needed supplies of petroleum and minerals?

A strong case was made by representatives of the petroleum, iron, and lead-zinc industries that, in the normal course of their foreign operations, production is expanding rapidly, in step with the growth of the United States and free world needs. Furthermore, evidence was presented as to the flexibility of their postwar investments in meeting local balance of payments and other problems, and as to the contribution which they are making to general economic development, not only of producing but of consuming countries. It emerged in the discussion that the firms which these spokesmen represent are operating in a reasonably favorable foreign investment climate. Moreover, other speakers pointed out that the views expressed by those industrial representatives were related more to short-term than to long-term estimates of United States requirements, however these may be assessed.

2. Should immediate steps be taken to supplement private investment by providing Government financing to attain long-run resource availability targets?

In all 3 of the industries discussed under topic No. 1, industry feeling was that no public funds were required at this time. The viewpoint was even expressed that there would be some danger of glut if there were a substantial amount of public financial interference in this investment field. There was, however, recognition of the fact that in special cases such as uranium and nickel, where an extremely rapid rate of development is now required for strategic reasons, governmental financial assistance is fully justified. There was support for expansion of lending by the International Bank and the Export-Import Bank to private enterprise in order to develop basic facilities in backward countries with known mineral resources, but lacking in necessary supporting services. There was discussion of the role which might be played by Government financial institutions in providing partial loan financing for private mineral developments abroad on a large scale where the large amounts of capital required for investment cannot possibly be provided by private sources. One industrial spokesman pointed out that the short-run position should not be allowed to obscure the long-run need.

3. The question of geological exploratory work: One of the most interesting points which emerged from the discussions was strong support for the use of United States Government funds for technical assistance to underdeveloped countries in making a basic appraisal of their mineral resource potential. It was contended that point 4 aid in this field would assume heavy costs for general surveys which private industry will not shoulder—could look further into the future than was the case with private enterprise—and would eliminate the problem that private firms would immediately expect concessions. The feeling was that, once a general shopping list was available, private enterprise could step in with effective exploration and development. There was considerable identification and general approval of a long list of past efforts and accomplishments of the United States Geological Survey and Bureau of Mines in this field.

Certain difficulties were discussed of expanding the use of point 4 in the mineral fields, including the problems of hiring competent technicians in sufficient number, avoiding the feeling in underdeveloped countries that the United States was fostering technical assistance simply for its own ends, and developing continuity in the technical-assistance program, in the face of its dependence, currently, on annual congressional appropriations.

An interesting suggestion was made that, in addition to expansion of such technical assistance, use might be made of small private foundations of established technical competence in providing such technical assistance. It was felt that assistance from such foundations might well be more acceptable politically to underdeveloped countries than from either United States governmental or commercial organizations.

4. Relationship of the development of raw-material resources to more general economic development: The strongest disagreement which emerged from the discussions concerned what was believed by many participants to be the necessity of fostering general economic development in underdeveloped areas if the United States was not to be excluded, ultimately, from mineral development in many countries.

Many industry representatives held the view that United States private investment in mineral resources was an excellent way of initiating general economic development in underdeveloped countries. Royalty and tax revenues made available by such development would be used, in due course, to foster more general economic development. Numerous examples were cited.

The opposing view was that the hopes of underdeveloped countries for rapid social and economic progress were so intense that, on balance, they would continue to cooperate with the United States in basic resource development only if they were directly aided in industrial and other more general programs for development. An instance was cited in the Middle East where single large private investment programs in the mineral or oil fields have come to be looked upon as an actual detriment to more general economic development by the country concerned. This problem was considered to be a general, and free-world-wide problem, of developing broad basic cooperation as a security step.

5. Obstacles to United States investment abroad and the steps which can be taken to overcome them: The chairman posed this problem as one of the most difficult faced by the conference, particularly when it came to fostering private investment in countries addicted to "creeping expropriation" and in which, as a result, private enterprise has no confidence. A sharp initial disagreement emerged with some speakers contending that the only answer was that, after reasonable efforts had been made to help such countries, a strong policy by the United States Government was required. This view was vigorously opposed by those who felt that nothing could be more harmful than such a United States policy. They pointed out that the United States cannot expect to race around the world thrusting itself into the raw materials of free world nations, but rather must build up a climate of respect, mutual confidence and patience. It was the view of many, including representatives of industry, that an aggressive policy would be disastrous.

There was some discussion of the effectiveness of trade and investment agreements with foreign nations in increasing the flow of United States investment abroad. Spokesmen of the mineral industry were extremely skeptical as to the usefulness of such treaties for their particular industry. One spokesman for a large trade group indicated that group's strong interest in the continuation of the program. Other speakers, who throughout the discussion had emphasized the importance of development of basic facilities in underdeveloped countries, questioned the effectiveness of any elimination of so-called trade and investment obstacles until basic economic development and the stability that went with it had been developed.

A number of speakers expressed the view that the most important step in overcoming obstacles to investment abroad was revision of United States tax laws.

Issues for further investigation

The discussion in these sessions highlighted three areas which might well warrant further investigation by the Ford Foundation:

1. The discussion indicated that there should be further study of means of expanding, and giving greater continuity to, point 4 assistance to potentially mineral-rich countries for basic geological and mineral surveys, to lay the base for private exploration and development.

2. The discussion stressed the importance of further study of the recommendations of the Paley Commission calling for United States Government tax concessions.

3. Perhaps most important of all is the question of methods of orienting United States private investment in the mineral field abroad, and perhaps supporting it with private and public investment in industrial and other fields, in such fashion that reasonable expectations of underdeveloped countries as to general economic advance may be satisfied, to assure their cooperation with the United States in helping to meet our future need for foreign resources.

SUBSECTION C—SUMMARY, MARKET STABILIZATION

William T. Phillips, rapporteur; Richard Weber, rapporteur; chairman, Simon D. Strauss.

The chairman outlined the historical volatility of raw material prices and the economic reasons lying behind this condition. He sketched the effects which price instabilities are likely to have on production and producing areas, pointing out the international frictions which they have generated in the past. The meeting was then opened for general discussion which centered around the following points.

1. Is governmental action for stabilization necessary?

There was general agreement on two important aspects of this question. First, that extreme price fluctuations are particularly onerous for raw material producers and as such, are an undesirable element on the international economic scene. Secondly, the maintenance of high levels of employment and income in the highly industrialized countries will provide a significant contribution to the problem of raw material stability, both as to price and volume of consumption. However, it was the consensus that this approach would not fully stabilize raw material markets.

It was the view of several of the participants that since governments do intervene in raw material markets in a number of ways, there is a good case to be made for multilateral action as being less disturbing to markets than uncoordinated unilateral Government action such as tariffs, subsidies, and the like. A number of participants took issue with this approach.

2. Are intergovernmental agreements desirable?

The views of the group were sharply divided on the philosophy of market intervention by governments. One group favored a return to free market conditions. However, it was pointed out by others that in view of the fact that governments engage in stockpiling, tariffs, quotas, subsidies, and the like affecting raw materials, it is unlikely that a return to complete market freedom is possible. Those favoring a multilateral governmental agreement approach argued that it wa sunfair to put the whole burden of adjustment to changing market conditions on the shoulders of producers, particularly foreign producers, where social and political instability may be involved. Several members felt that a willingness to negotiate agreements would eliminate some of the international frictions which arise out of raw material problems. Others felt that the negotiating frictions would be even more intense than those generated by an impersonal market which was allowed to operate.

One participant expressed the fear that in order to negotiate an effective agreement, it would be necessary to include all synthetic substitutes, control the rate of technological change and, in effect, to control the entire domestic and international community.

3. Are intergovernmental agreements feasible and practical?

There was general agreement that price and quantity regulation is a complex and difficult task. Some doubted that it could be done effectively, it at all. Others felt that the United States has become heavily involved in market regulation domestically, primarily in agricultural products, and that we should be willing to at least attempt to work out multilateral arrangements—recognizing the complexities and difficulties involved.

One participant analyzed the periods of worst price variations—wars and depressions. In these extreme cases of alterations in the pattern and magnitude of demand, he seriously doubted that any commodity agreement could effectively deal with the problem.

The danger of sporadic governmental financial support was cited as one reason for doubting the feasibility of intergovernmental commodity agreements. During the course of the discussions it became clear that generalizations were dangerous. Each commodity presents peculiar problems, not only economic but political. Wool was cited as a material where an agreement is unlikely since the Australian producers, the largest in the world, favor a free market. Cotton, on the other hand, while susceptible to an agreement, probably will not be likely to take the multilateral contract form, similar to the wheat agreement, since consuming countries are not willing to take on purchase commitments in cotton while they are on wheat.

The view was expressed by one member that underdeveloped areas would prefer a low stable price rather than high unstable prices or even high stable

prices which would endanger their future position as substitutes come into the picture.

4. Characteristics of commodity agreements

Considerable discussion centered around the failures and abuses of the pre-World War II type of producer agreements. It was the consensus that these agreements generally ignored consumer interests and in a number of cases became instruments of monopolistic abuse. On the other hand, it was stated that considerable work has been done regarding commodity agreements, and techniques have been devised which should mitigate some of the more undesirable features of earlier agreements which were negotiated in a "surplus" context. The view was expressed that reasonable price stability makes for a more stable balance-of-payments position for producing countries. Thus exchange controls, standard-of-living problems, and political unrest become less acute.

5. The United States stockpile and price variations

It was the feeling of the group that in a number of specific instances stockpiling activities have accentuated raw material price swings. In the past, these actions stemmed from sporadic appropriations policy and also from the same motives which induce private buyers to abstain from buying in certain periods and accelerate their buying when international tensions become acute.

There was general agreement that the present strategic stockpile is an inappropriate instrument to use as a mechanism for market stabilization. This is so since security is the overriding consideration and sales from the stockpile are not permitted except in emergencies.

The sheer size of the United States stockpile operation—some $9 billion—inevitably has a serious impact on raw materials markets and poses serious problems when goals have been achieved and demand slackens. This may cause hardship and political unrest in produicng areas which in turn, endanger United States security. The degree of United States responsibility regarding producing areas which have been stimulated by stockpile purchases, raises many unsolved issues.

6. Mitigation of price extremes

As an alternative to close international controls over price and quantities, the chairman outlined several alternative techniques for eliminating the extreme peaks and valleys in raw material prices. The major part of the discussion was on the buffer stock technique although some consideration was given to long-term contracts which provide floor prices as an assurance to producers. The group considered two types of buffer stocks—those with and those without quota arrangements.

7. Buffer stocks

International buffer stocks are arrangements for supporting sagging prices and suppressing rapid price rises. They are intended to eliminate the extreme of price variations. Properly an equilibrium price which would equate long-run supply and demand should be the local price above and below which buffer stock operation would operate. The equilibrium price should be changed periodically as demand and supply factors changed.

The cost of a buffer stock operation for a number of basic raw materials was one major point about which fears were expressed—particularly the interest costs involved. One member pointed out that if the long-term trend of raw material prices in up, as was estimated by the Paley Commission, then buffer stock operations were likely to be profitable, since the operators of the pool would buy when prices were low and sell when they were high. Several members expressed the view that buffer stocks would be ineffective in the absence of quota restrictions.

8. Unilateral United States action

As an alternative to an intergovernmental approach to raw material problems, it was suggested that it might be possible for the United States, operating alone, to stabilize prices either through long-term contracts or through a unilateral buffer stock. The dangers and frictions inherent in such a proposal were discussed briefly. It was pointed out that foreign producers might be reluctant to see the major consumer take it upon itself to fix international prices. It was also pointed out that foreign consumers would also be opposed.

MID-CENTURY CONFERENCE ON RESOURCES FOR THE FUTURE

(Subject to further comment by this section's participants)

Section VII, chairman, Earl P. Stevenson; co-chairman, R. E. Gibson; Dr. Howard Meyerhoff, rapporteur. December 4, 1953.

PROBLEMS IN RESOURCES RESEARCH (REVISED SECTION DIGEST)

The deliberations of section VII centered around a steering committee paper entitled "Problems in Resources Research" as a base, and The Basic Challenge to Research in the Resources Field was outlined in an introductory statement by Paul B. Sears. It was stressed that knowledge grows unpredictably and that, because of its unpredictability there are haphazard elements in the financial and public support of research and in the availability of key personnel. Some guidance can be given in the direction, or directions, that fundamental research may take, and in considering a program for the future it should be noted that, to date, there has been much more ample backing for the physical sciences than for the biological sciences, including the science of man and human fertility. As a result there is a greater need for fundamental information in biological fields than in physical, but in the whole area of science and technology there is comparatively little correlation with the social problems which they create.

For the most part, research has exhibited a preoccupation with finite projects, few of which have been studied in the broad context of their physical and human environment. There is, in fact, only a dim appreciation of the infinite possibilities arising from human ingenuity. Discussion of the overall problems of long-range resource research revealed some differences of opinion as to the relative emphasis and chronological order of research involving social and political problems, but it was generally recognized that the development of resources on a finite planet for a growing population with expanding social needs cannot long neglect, and can at no time ignore, social implications. The general problem can be stated in concrete terms and can even be summarized in mathematical equations, but in the process of formularization there is the risk of oversimplification.

In looking ahead 25 years in an attempt to assess the needs of humanity, not only at that time but in the interim, attention must be devoted to the strategy rather than to the tactics of resources research. Although science measures nature, it also serves to provide us with some comprehension of the universe in which we live. Man must thus regard himself as a scientific object and as a medium of comprehension with sufficient ingenuity to adapt himself to, and in part control, his resource environment. At the present time men and communities are too often victims rather than masters of their environment. It will require the sum total of science and technology, involving a stupendous task of intercommunication, to define and to solve the aggregate of problems.

Renewable resources, Stanley A. Cain

The central problem of the renewable resources as presented by Stanley A. Cain involves the maintenance of, or increase in, these assets to meet the demands of a growing population. There must be a differentiation between latent and active resources and the aim of science and technology is the conversion of latent to active resources as rapidly as demand and human ingenuity permit. The natural resources budget is not balanced even with respect to the renewable resources, and in expanding the utilization of the latter, one is constantly confronted with the question as to whether the standard of living can be raised by increased utilization without expending natural resource capital at the expense of future generations.

Paradoxically, the biologists tend to take a pessimistic view of resources for the future for a population that has infinite capacity for reproduction, whereas the physical scientists, dealing with the nonrenewable resources, are inclined to optimism. In discussion of this point it was suggested that the physical scientists may have acquired their optimism as a result of measuring the comparatively vast—if sometimes diffuse—reserves against the relatively modest rate of consumption.

The breadth of the problems involved in the renewable and, specifically, the biological resources makes it difficult to isolate tangible projects that will win financial support. Hence this field is at a disadvantage in the competition for research funds, and some investigation has been accomplished by the diversion of funds to basic research through the device of tagging fundamental research

with a military label. The needs for support range over the entire field, starting with: (1) survey, inventory, and analysis; (2) an infinite number of long-range problems in every field; (3) the division of research responsibilities among the fields and between and among government, educational, and industrial organizations; (4) an overall approach to the ecology of renewable resources and of their relation to man and his social structure. Over the entire field there are large, fundamental areas of ignorance that call for basic information on virtually every phase of the cycle of resources-renewable, and it would not be amiss if fundamental studies started with genetics within each of the several disciplines involved.

The interrelationship of the several biological fields concerned with renewable resources expressed in part—but only in part—in the field of ecology indicates the need for team research. But most of the members of the section who expressed views on this subject emphasized the need for the selection of capable individual researchers to carry on the tasks confronting the biological sciences. Although there is a tendency to support projects, which may or may not be carried on by teams of researchers, even here the emphasis is on the capability of individual leaders, well trained and inspired to carry out projects that are tangible enough for budgeting.

In the discussion of fundamental research related to the renewable resources, a theme that became recurrent made its first appearance: The future of research depends first of all upon highly qualified personnel; second, upon adequate communications; and, third, upon the integration of the accumulated and new knowledge from different but interrelated areas. It was made amply evident that research cannot proceed without personnel, regardless of the financial support available, and that research effort is retarded by deficiencies in communication.

The suggestion that a more conservative view of human needs might limit the problem and thus make it more soluble was rejected on the assumption that the American people will not accept a recession from current standards of living, and that any research program must accept as its premise a substantial increase in population, with a probable rise in the standard of living. This assumption by no means sets aside the imperative need to consider the manifold problems of conservation, for the question of waste is in itself a research area that should have a high priority. The history of technology is very brief in contrast with the history of man, and it is not surprising that attention has been focused primarily on development rather than on conservation.

In view of the severe limitations of trained personnel and of financial support, it was agreed that there must be some determination of priorities, with judicious allocations of research workers and money. Perhaps a broader base of financial support might be obtained if scientists will emphasize the monetary value, actual or potential, of research that is being contemplated, for it can commonly be shown historically that major long-range developments have paid off from the standpoint of investment and return. Whether research on the renewable resources should be concentrated in a small number of new or well-chosen old institutions proved to be a debatable issue, but upon the need for continuing projects with adequate support there was essential unanimity. Ironically, the major scientific advances in the general field of agriculture have been based upon discoveries made in nonagricultural institutions.

Energy resources, Philip Sporn

One of the obvious areas of spectacular growth will inevitably be in the need for energy resources, and Philip Sporn predicted a fourfold growth in the demand for energy in the next 25 years. To meet the demand he outlined a number of technological problems for which concentrated research will undoubtedly provide solutions. It may be presumed that the amount of convertible hydroelectric energy is finite; the supplies of petroleum and natural gas are exhaustible; the utility of tidal power is limited, not to say dubious, in the immediate future, but the potential of solar energy may prove to be a fruitful field of investigation, particularly in its relation to photosynthesis; and the potential of atomic power cannot yet be appraised. The development of the fuel cell may not reach the point of commercialization within the quarter century under consideration, but it is probable that important advances will be made with this interesting and unique energy potential. For the United States, the future depends upon the coal reserves which, fortunately, are convertible to any type of energy that may be required in the national economy. Despite a large coal reserve, economy of use is desirable and can be achieved through the improvement of coal technology and the solution of many problems of conversion or synthesis. In this field, too,

there are social implications which should not be ignored or neglected. Increased fuel consumption may modify climate, and this possibility demands investigation. The major unutilized coal reserves lie in the lignite and subbituminous fields of the Missouri Plateau and Rocky Mountains. Utilization will inevitably involve major shifts in population, in the locus of industrial activity, in transportation facilities, and in other economic activities. And to avoid chaos these social factors should be anticipated in any resources research program.

Nonrenewable resources, Thomas B. Nolan

With respect to the supply of nonrenewable resources, consisting principally of metallic and nonmetallic minerals, Thomas B. Nolan sketched the urgent need for fundamental research in the origins of minerals and in the development of tools to detect them; in the distribution of elements in the earth's crust, and in the development of techniques to convert lower grade deposits to economic use; in the physical and chemical properties of elements and compounds to determine whether substitutes might be found for mineral raw materials in short supply. Once again, the imperative need for research personnel was stressed, as was the need for instrumentation that will enable geologists and geophysicists to locate and to define the potential of mineral deposits well in advance of national need. These two subjects—personnel and instrumentation—received more attention than the rather specific research projects within the general field. But a need for the introduction of mathematics and especially of statistics, as well as inductive reasoning, into this field was stressed; and from a still more practical standpoint it was pointed out that some very simple needs are still unmet—for example, the need for adequate maps and the full application of well-known and well-tested techniques, the possibilities of which have not yet been exhausted.

Sea and air resources, Athelsten Spilhaus

Dean Spilhaus dealt with resources of the sea and air, giving special emphasis to the principal product that both supply—namely, water. He defined the research objective in this area as that of time and space control of precipitation, but before this can be accomplished, there must be a much more exhaustive investigation of scientific principles specifically in the fields of meteorology and oceanography. The possibility of a wider use of engineering in the redistribution of water was considered, as was the control of precipitation through the techniques popularly known as "rain making." The paucity of meteorological and oceanographic data is a deterrent to applied research, and it should precede any attempt at applications that will utilize the ocean and air as a source of food and minerals, as well as of water.

Columbus O'D. Iselin gave further point to the research requirements for more effective use of the ocean as a source of food supply. At least 80 percent of the photosynthetic activity on the earth takes place in the oceans and without aid from science, a fact that suggests the possibility of indefinite expansion in the fishing industry. It is unlikely that the United States will have to call upon the ocean to augment the national food supply within the next 25 years, but scientists may profitably use the period for research on the biology of fishes and on the ecology of their food supply, including the natural growth of algae, as well as the possibilities of controlled algal growth. Methods currently used in the fishing industry are still primitive, and this activity can undoubtedly benefit greatly with the introduction of engineering techniques.

Apparently this field with all of its potential has comparatively little lure for students, and in noting the scarcity of young researchers, the homely fact that there are few jobs for graduates in this line of work was emphasized. Yet such fundamental studies as the ocean as a source for food, and as the control of precipitation to assure adequate water supplies for agriculture and in desert lands, are alluring problems, but of such broad scope that they do not stimulate financial support or provide job opportunities. The opinion was expressed that biologists are not making the most of the public relations value of biological discoveries and, like scientists in other fields, may profitably cultivate public relations in their effort to augment their financial reserves and their personnel.

Fundamental research as a resource, R. E. Gibson

From these several discussions it became obvious that fundamental research is in itself a potential resource to which more emphasis can appropriately be given. Once again, the importance of personnel occupied the attention of the section. Personnel was classified into researchers of six different types, all of which are essential in a complete research program. The attempt to differentiate funda-

mental from applied or technological research was only partially successful, but the stimulant that each provided for the other became obvious in the brilliant pholosophical discussion offered by R. E. Gibson.

People and organization, Paul Weiss

Paul Weiss stressed the fact that scientific research is a collective effort, and that in our institutions of learning there should be more emphasis upon the importance and the rigorous requirements of interdependence. He compared the organization and development of knowledge to the growth and functioning of organisms, making it apparent that knowledge is organic, and that it depends to a very high degree not merely upon individual inspiration and ingenuity but upon communication. He stressed the importance of keeping the researcher essentially "uncommitted" and of assuring that his efforts will not be channeled into orthodox projects, and the impossibility of carrying on individual research in the vacuum of a single field was made apparent.

Deficiencies in our educational system occupied the attention of the section for some time. The fear was expressed that we may even at this early date be too late if we are to give adequate training to the researchers who must provide the answers in resource development a quarter of a century hence. Analysis has shown that those entering the field of education have relatively low intelligence quotients; it is common knowledge that the public accords them not merely low esteem and inferior status, but inadequate economic support, hence seems to be getting what it pays for. If we are to interest the younger generation in scientific and technological careers, we must improve the status of our teachers, and especially those at the secondary school level. We must also attend to the quality of our college teaching, nor can we neglect the quality of graduate instruction. Whether the support for this kind of educational program from grammar to graduate school should come from government or industrial sources did not greatly concern the section, for it was recognized that the independent as well as the collaborative activity of government and industry is a fundamental feature in the pattern of research, and is likely to be continued with contributions of personnel and facilities from educational institutions.

In the review and summarization of the deliberations of section VII, there was some feeling that the obvious may have been overlooked or underemphasized. It should be evident that the need for resources research is predicated upon a growing population with expanding requirements, and in this sense it transcends the normal processes of growth and undergoes dynamic change. A sober examination of the manifold problems presented by population, ranging from reproduction and statistics to social patterns, may prove an essential prerequisite for an intelligent approach to the balance of he resources problem. Perhaps society is not yet ready for such an investigation with all of its ramifications, but neither are scientists prepared to undertake and to carry it through to its logical conclusions. For this reason it is likely to be a continuing element in the entire program of research, and one to which profounder intelligence can be brought as basic discoveries are made in fundamental sciences.

That these discoveries may be in peripheral areas of the several disciplines and may thus involve the collaborative work and thought of specialists in several fields, or even of generalists in all fields, is apparent and suggests the direction in which scientific training must move. It also points the need for more effective communication that will break through disciplinary boundaries. Even more serious are the severe limitations that are placed upon science and technology in consequence of the shortage of personnel. Efforts must be made to draw upon the reserve of intelligent young men and women who do not enter college. Those popular fields of research that attract financial support to the extent that they are overfinanced and overmanned must be placed in better perspective, and more encouragement should be given those researchers who have the temperament to enter more venturesome fields. Despite the difficulty of assessing the many projects that should receive atention, there must be some organization of manpower and some ordering of projects in order that the limited supplies of men and money can be utilized with utmost efficiency. Scientists and technologists must also recognize that the applied problems on which they are working tend to create broad and basic social problems, the solution of which cannot be entirely divorced from scientific research or removed from the sphere of responsibility of science and technology.

MIDCENTURY CONFERENCE ON RESOURCES FOR THE FUTURE

Section VIII—Patterns of Cooperation. H. Christian Sonne, chairman. December 4, 1953.

SECTION SUMMARY FOR PRESENTATION TO THE CONFERENCE IN GENERAL SESSION

The subject matter of section VII was "Patterns of Cooperation." This we took to mean the relations between citizens, organizations of all kinds (business, labor, agriculture, and others) and governments at all levels, through which programs of research, planning, education, and action affecting natural resources are carried on. The discussion was based largely on reports of actual cooperative experiences brought out by the participants. The thought was expressed that section VIII was especially important to the entire conference because carrying out solutions proposed in other sections would depend in large measure on the effectiveness of such cooperative relationships.

In our first session we discussed cooperation at the grassroots. After all, the basic purpose of resource programs is to influence the behavior of individuals and groups as well as the management of the resources. Examples were cited from the fields of forestry, farming, wildlife protection, and stream improvement of successful instances of local initiative and application of good conservation measures.

In the second session we talked about problems of cooperation on wider bases. The resource programs of two States—New York and California—were examined from the points of view of the variety of their undertakings, their successful innovations, and the difficult problems encountered. Ways of dealing with river valleys and other resource entities transcending State boundaries were discussed, and a number of aspects of interstate compacts and interstate commissions were explored in some detail. The relevant experience of the United States and Canada with problems along their common boundary was noted.

The third session was on the problems of translating knowledge into action by developing effective lines of communication between resource researchers and those who ultimately apply research findings. Instances of the need for better communication were cited, most of them requiring improvements in the processes of planning and application. It was brought out that patterns of social purposes and the necessary competences have to exist before successful cooperative action programs can be achieved.

In our discussions we did not achieve—nor did we seek—agreement on several questions, such as:

1. The relative emphasis to be placed on local initiative and responsibility as compared to stimulation and support by State, regional, and National agencies and groups (although it was generally agreed that someone must provide the spark of leadership);

2. What the precise allocation of responsibilities between public and private agencies, and between the various levels of government, should be;

3. In what instances one or another specific device or organizational form—such as the valley authority, the interstate compact, or the local resources district—should be used, recognizing that each approach has particular advantages.

We report substantial agreement on several important points:

1. Problems of resource management should not be left to the inevitable increase of scientific knowledge and technology. Americans, through their Government and private bodies, have to take an active interest in resource management if problems are to be dealt with in time.

2. Our whole political tradition, the character of our people, and the organization of our society are such that resources planning and management can never be completely centralized. There must always be a degree of dependence upon voluntary cooperation between individuals, groups, and Government agencies.

3. Since public agencies contribute much to our effort, it is essential that, regardless of the extent of their powers, they be organized so as to be responsive to the public interest. A clear grouping of functions, coordination of planning, and streamlining of operations in agencies dealing with resources at all levels would facilitate cooperation with private persons as well as intergovernmental cooperation.

4. The most effective cooperative programs have been those that attacked urgent problems, were definable in scope, had specific objectives, or resulted in easily understood gains. However, there is need to work out better integrated programs to meet complex resource situations.

5. The will and ability to cooperate—to talk to each other without getting mad, as one participant put it—are essential. The behavioral sciences are providing increasingly useful knowledge about how to organize groups and communicate more effectively; therefore, resources scientists can profit from exchange of knowledge with the social scientists. Cooperation may be an art, but it is not a magic.

It was the sense of the meeting that much more needs to be done if the full potentialities of cooperative efforts for resources development and conservation are to be realized. Specifically, the following proposals were strongly supported:

(*a*) There should be increased emphasis on resource problems in both youth and adult education.

(*b*) We need research on how to utilize the behavioral sciences and communications techniques to carry knowledge of the best resources practices to the people.

(*c*) Finally, and probably most important, building upon the work of this section, there should be continuing study and investigation of patterns of cooperation, either by the organizers of the conference and/or by some other suitable group. As an eample, special study should be given to the administrative arrangements, fiscal and other, which handicap cooperative resource programs as between the States and the National Government, as between the States themselves, and as between the States and local agencies and groups.

WHITE HOUSE CONFERENCE ON RESOURCES FOR THE FUTURE, DECEMBER 1952

BACKGROUND AND PRELIMINARY PLANS—RESOURCES FOR THE FUTURE, INC., WASHINGTON, D. C.

Plans are being made for a White House Conference on Resources for the Future to be held in Washington, D. C., on March 25, 26, 27, 1953, at the Mayflower Hotel. This conference will be the first of its kind since President Theodore Roosevelt's National Conservation Conference in December 1908.[1]

Timing.—The beginning of a new administration in Washington next year and the public interest aroused by the reports of the President's Committees on Materials Policy, Water Policy, and Government Reorganization provide an opportunity for a new beginning and a new orientation of public opinion toward the conservation, use, and development of our resources.

Objectives of the conference are:

(1) To call the attention of the public, industry, and Government to the resources problem, its nature, and possible solutions;

(2) To provide a forum for full discussion and better understanding of issues and policies aimed at providing needed materials for a growing dynamic economy and at resource conservation and development;

(3) To formulate new objectives and next steps for action by individual citizens, private groups in industry, agriculture and labor, by citizen organizations and conservation agencies, as well as by Federal and State Governments.

Theme.—The theme of the conference will be the question: "How Shall We Provide the Resources for the Nation's Growth, Welfare, and Security?"

Scope.—The scope of the conference will be "The Conservation, Wise Use, and Development of our Resources."

Sponsorship.—The new corporation Resources for the Future, Inc., will sponsor the conference. For a White House Conference, the invitations go out in the name of the President, and President-elect Eisenhower has indicated his willingness "to issue or join in an appropriate call of the conference"—presumably in late January. President Truman has pledged the support of his office in preparing for the conference.

Leading organizations are being asked for their cooperation, participation, and assistance in the planning and conduct of the conference.

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[1] A White House Conference was held by Theodore Roosevelt in 1908, which was also the first meeting of the governors' conference. It was attended by "20 governors of States and Territories, personal representatives of 11 governors or governors-elect, members of 26 State conservation commissions, and presidents and representatives of 60 national organizations." The joint conference, as it was called, met at the invitation of the President in the Belasco Theater, and was opened by President Roosevelt and President-elect Taft. The costs of holding the joint conference were covered by assignment of Government personnel and by those attending paying their own expenses. It passed a number of resolutions relating to procedures for followup of its interests. Followup conferences were held annually in different parts of the country over several years.

Attendance.—Attendance at the conference will be by invitation to agencies and individuals, with representation from Federal and State Governments, educational groups, business, industry, agriculture, and labor, as well as conservation agencies and citizen interests. All those invited will either be requested specifically to attend a given section or be asked to indicate their choice of a selected list of sections which they will agree to attend. Attendance is anticipated of more than 1,000. The general rule will be that everyone finances his or her own way.

Organization.—It is proposed to organize the conference in sections after the general opening session and keynote address: 10 or 11 sections have been considered with 3 meetings of each section—on the afternoon of the first day and mornings of the second and third days. Each section might have an average attendance of 100.

General sessions.—Besides the usual general opening session with welcoming addresses, a keynote address may be scheduled at the first day luncheon.

During the evening of the first day it may be desirable to schedule a general session with some addresses or a motion picture.

At the second day luncheon and extending into the afternoon, a group of general speakers—from Congress, other governors, and officials or distinguished citizens—might be presented.

Under the section-type organization for a conference, the final general session usually results in presentation of a series of reports from the various sections and adoption of resolutions. For this conference a somewhat different tone might be set by emphasizing in each section report a theme of "What needs to be done next?" or outlining the gaps to be filled in policy and information—thus giving some answers to the inevitable question, "Where do we go from here?"

The main dinner meeting will be held the last evening at the Statler Hotel with the President of the United States invited to address the conference on that occasion.

Section meetings.—Several somewhat unusual procedures have been suggested for conduct of the section meetings:

(1) Only 1 paper—prepared and circulated in advance of the conference presenting 2 or 3 major questions or issues with background factual material. This "Chairman's paper" will be prepared by staff members with the guidance of the chairman and a section steering committee of 4 or 6 members chosen for their diversity of opinions on the issues.

(2) A panel discussion of the chairman's paper by members of the steering committee at the first section meeting to emphasize the different or controversial aspects of the problems at issue.

(3) Testimony by delegates, on written request, with statements limited to 5 minutes and subject to questions from members of the steering committee.

(4) A draft of statement of consensus on next steps or answers to the original questions for discussion at the third section session.

Section subjects.—The subjects to be covered by the conference are so broad and so diverse that choice of problems to be discussed must be highly selective. There is no prospect of establishing a separate section for each major field of interest or of having each section cover all of its field.

The lineup of section subjects now being discussed is given below. The actual names of sections are provisional working titles only, and the substance of the sections is still subject to change. Consolidations, additions, or subtractions still are possible. The tentative list follows.

(1) Future land use patterns to meet all needs—stressing relationships among forest, range, and croplands, urbanized areas, scenic and recreational, wildlife, and "withdrawn" areas.

(1a) Problems of management of renewable resources.

(2) Water use patterns—the relationships among various uses and problems—multiple purpose and single planning for each drainage basin (whatever the organization may be).

(3) Energy—including: (*a*) Fuels, oil and gas; (*b*) coal and shales; (*c*) water and steam; (*d*) atomic and solar.

(4) Minerals—nonfuel (not including tariff)—requirements, exploration, effective use, substitution, security, and land-use considerations.

In each of these sections the section paper might outline (*a*) scope of the problem and needs in 1975, (*b*) approaches to meet this need, (*c*) outlines of possible policies.

(5) Demand for materials in 1975 and limitations on resources to support a growing dynamic economy. The subjects here are the assumption of a "growing

economy," how to measure the demand, and to stress the problems of use and development of renewable and nonrenewable resources.

(6) Technology: The need for basic data, research, and technology—to identify the critical needs and place responsibilities for action.

(7) World relationships—supply, sources, trade, investment, market, and security.

(8) Motives for needed action—incentives and compulsion for action—to stress the role of private action and ways of getting action.

(9) Education and citizen participation. How to create awareness and action.

(10) Organizing to get the job done—problems of administration and organization in private groups, citizen organizations, State and Federal Governments.

[From Business Week, November 15, 1952]

CONSERVATION PLANS ON THE GRID

ABOUT 1,000 EXPERTS IN INDUSTRY, AGRICULTURE, LABOR, AND GOVERNMENT WILL CONGREGATE IN WASHINGTON NEXT MARCH TO THRASH OUT THE PROS AND CONS OF PALEY COMMISSION PROPOSALS

The voluminous report on the long-range United States materials outlook, issued in June by the President's Materials Policy Commission (Business Week, June 28, 1952, p. 160), is slated for a full-scale public review.

PMPC, generally known as the Paley Commission because it was headed by William S. Paley, Columbia Broadcasting System's board chairman, concluded that United States industrial production will double in the next 25 years while we become more and more a have-not Nation in materials. In its report, the Commission came up with a series of controversial recommendations on what to do about it.

This week, Resources for the Future, Inc.—a new, private, nonprofit research corporation—announced that it will hold a "citizens' conference" at Washington's Mayflower Hotel, March 25–27. The conference will be a big-time public forum at which PMPC proposals and other aspects of natural-resources policy will be thrashed out. It will be attended by about 1,000 industrial, farm, and labor leaders, and top Government and academic figures in the field of conservation.

Controversial: The announcement came after almost 4 months of conflicting talk about PMPC's report. So far, the report has been (1) praised for "bringing into focus for the first time a wide range of expert opinion on the Nation's total materials problem," and (2) damned as a "rehash of muddy Washington thinking."

In general, the Paley Commission laid out about 78 specific recommendations, including:

Destroy the philosophy of protectionism and the notion of self-sufficiency.

Remedy the "severe neglect" of technology by Government support to research and scientific education.

Boost the Nation's usable resource base by increasing mining exploration, conservation, and materials substitution.

Pass new laws to encourage conservation at home and to expand resources here and in foreign lands.

Opposition: The mining industry in particular has flayed PMPC's report. Biggest thorn in the sides of some mineowners: PMPC's strong emphasis on the least-cost principle. This is rightly interpreted as a push for more metals imports as against development of mineral self-sufficiency at a higher cost in the United States.

The mining industry also objects to a proposal for "international buffer stocks" to stabilize world commodity markets. And it hoots at the projections of future demand for specific metals. Many mineowners claim there's no way of predicting accurately how much demand there will be in 25 years for any one material. Such unknowns as future price relationships and expanding technology make specific projections meaningless, the critics contend.

Who's who: The mining industry and other critics will have their say at the March conference, but the program won't be loaded in their favor. Resources for the Future, Inc., the sponsor, wants a general discussion of both sides—in keeping with its objective of promoting research and education in natural-resources conservation.

Resources for the Future was first set up as an advisory board to the Ford Foundation, which presumably will pay for its activities. Heading Resources for the Future is Horace M. Albright, president of U. S. Potash Co., Inc., and one-time director of the National Park Service. Paley is a member of the group's board of directors.

Also on the board are: Edward J. Condon, vice president of Sears, Roebuck & Co. and former president of Friends of the Land; Dr. Reuben G. Gustavson, chancellor of the University of Nebraska and a former official of the Argonne National Laboratory for Atomic Energy; E. B. MacNaughton, former president of Reed College and the First National Bank of Portland, Oreg.; Leslie A. Miller, former Wyoming Governor and Chairman of the Hoover Commission's Resources Task Force; Fairfield Osborn, president of the Conservation Foundation; Beardsley Ruml, treasurer of the Democratic Party's National Committee and former adviser to the National Resources Planning Board; Stanley Ruttenberg, CIO's director of education and research; M. L. Wilson, director of the Agriculture Department's Extension Service; and Charles W. Eliot, former Director of the National Resources Planning Board, and now a Ford Foundation official.

Prestige: To give the conference more significance, the sponsors approached President Truman and both Presidential candidates before the election to support the project. All approved enthusiastically. Said President-elect Eisenhower this week: "It is high time that the Conservation Conference of 1908 should be reborn in a midcentury setting. I shall be glad to * * * ask the cooperation of governmental and private agencies in the preparations for the conduct of the conference meetings."

This was just what the doctor ordered for the conference sponsors. Eisenhower was referring to the famed White House National Conservation Conference of 1908, at which conservationist Gifford Pinchot, associate of President Theodore Roosevelt, presided. From this confab stemmed the first big plans for reclamation, national reforestation, and waterways management.

Albright's outfit is looking for similar big things out of its March meeting. Industrial materials will be the meat of the forthcoming meetings. But the conference will also discuss the report of the President's Water Resources Policy Commission (issued almost 2 years ago); a study by the National Security Resources Board, recommending how to put PMP'C proposals into effect; the Hoover Commission report on organization of governmental natural-resources agencies; atomic-energy programs; and the "social values" of conservation.

PROGRAM—MID-CENTURY CONFERENCE ON RESOURCES FOR THE FUTURE

The Shoreham Hotel, Washington, D. C., December 2, 3, 4, 1953; Resources for the Future, Inc.

How can we mobilize our resource base—land and its products, water, minerals, and energy—to support the continuously expanding demands of a growing population and contribute to sound economic growth and national security?

THE BACKGROUND

The midcentury conference on resources for the future is a working conference—nationwide in scope—a citizens' conference for free discussion of the issues by people concerned with our resources. Initiated by Resources for the Future, Inc., a nonprofit corporation devoted to research and education in the field of resources development and conservation, the conference is financed by a special grant from the Ford Foundation. Its objective is to survey the natural resources of the Nation, explore the demands that may be placed upon them during the next 25 years, and investigate methods of use and conservation.

These questions are basic to all discussion—

Will the Nation's resource base be so diminished during the next 25 years as to precipitate a series of critical situations?

Can such situations satisfactorily be left to extemporaneous solution, or have we reached a point in our economic development when it is desirable for industry, government, and citizens to work toward coordinated resource study and action?

Do we know enough about our resources, their interrelationships, the possibilities for substitution and technological advances, and the needs and resources of other nations, to make it possible to foresee and mitigate critical situations?

In seeking answers, the conference will record no votes, approve no resolutions. It will, instead, block out areas of agreement and of disagreement. No specific program for resources will be proposed; the attempt will be rather to provide a groundwork for policymaking by private and public agencies. It is recognized that the Nation's first resource is its people, but the questions relating to human resources are so vast that they cannot adequately be covered in a conference of the midcentury scope.

The conference is organized to work in eight sections meeting concurrently, each section dealing with a resource area or with an aspect of the total resource picture. The steering committee of each section has prepared a paper intended to provide the springboard for section discussion.

As common background for all sections, the Brookings Institution has prepared a paper on the general outlook for resources for the next 25 years and beyond. This material deals with trends in population, levels of living, and other factors bearing on production and use of material resources. The paper is the point of departure for a panel discussion during the general session of the morning of December 2.

THE SECTIONS

I. Competing demands for use of land

Chairman: Charles C. Colby, professor emeritus of geography, University of Chicago. Cochairman: Harry R. Wellman, vice president of the University of California at Berkeley. Steering committee: Robert Chandler, president of the University of New Hampshire. Raymond B. Holbrook, attorney with United States Smelting, Refining & Mining Co., Salt Lake City. William R. Mathews, editor and publisher, Arizona Daily Star, Tucson. Julian McGowin, secretary-treasurer, W. T. Smith Lumber Co., Chapman, Ala. Willis H. Miller, director of planning, San Diego County, Calif. Joseph Pendergast, executive director, National Recreation Association, New York. A. W. Sampson, professor of forestry, University of California at Berkeley. Anthony W. Smith, assistant general counsel and secretary of the conservation committee, Congress of Industrial Organizations, Washington. Chairman of subsection A—urban land: Willis H. Miller. Chairman of subsection B—rural land: Robert Chandler. Rapporteurs: Section I—James G. Rettie, United States Forest Service, United States Department of Agriculture. Subsection A—Victor Roterus, chief, Area Development Division, United States Department of Commerce. William Royce, Nonmilitary Defense Staff, Office of Defense Mobilization. Subsection B—Wayne Dexter, secretary of Outlook and Situation Board, Bureau of Agricultural Economics, United States Department of Agriculture. Assistant to the section chairman: James G. Rettie.

II. Utilization and development of land resources

Chairman: Lloyd E. Partain, sales manager, Curtis Publishing Co., Philadelphia. Cochairman: Samuel T. Dana, dean emeritus, school of natural resources, University of Michigan. Steering committee: Murray Benedict, professor of agricultural economics, University of California. Benton R. Cancell, vice president in charge of operations, Rhinelander Paper Co., Rhinelander, Wis. Waters Davis, president, National Association of Soil Conservation Districts, League City, Tex. George W. Dean, Virginia State Forester and president, Association of State Foresters. Paul A. Herbert, director, division of conservation, Michigan State College. R. C. Jacobson, secretary-treasurer, Minnesota State CIO Council. Harold Wilm, associate dean, college of forestry, State University of New York. Chairman of subsection A, food and nonwood fibers: Murray Benedict. Chairman of subsection B—Timber and wood products: Benton R. Cancell. Chairman of subsection C, Wildlife, scenic, wilderness, and other recreational areas: Paul A. Herbert. Chairman of subsection D, watershed values: Harold Wilm. Rapporteurs: Section II—Richard L. Kenyon, managing editor, Journal of Agricultural and Food Chemistry. Roy Battles, assistant to the master, National Grange. Subsection A: Walter B. Garver, manager, agricultural department, Chamber of Commerce of the United States. Raymond P. Christiensen, Agricultural Research Service, United States Department of Agriculture. Subsection B: Lowell Besley, executive director, American Forestry Association. James B. Craig, editor, American Forests. Subsection C: Edward H. Graham, Assistant Chief, Soil Conservation Service, United States Department of Agriculture. Sidney S. Kennedy, Recreational Planning Division, Na-

tional Park Service, United States Department of the Interior. Subsection D: Gordon K. Zimmerman, research director, National Agricultural Research, Inc. D. Harper Simms, Chief, Division of Information, Soil Conservation Service, United States Department of Agriculture. Assistant to the section chairman: John Bennett, Assistant Director, Technical Review Staff, United States Department of the Interior.

III. Water resource problems

Chairman: Gilbert F. White, president of Haverford College. Cochairman: Abel Wolman, professor of sanitary engineering at Johns Hopkins University. Steering committee: Jean S. Breitenstein, attorney, Denver, Colo. J. M. Clark, professor of economics, Columbia University. Warren T. Hannum, formerly chairman of the California State Water Pollution Control Board. W. W. Horner, consulting engineer, St. Louis. Claude D. Kelley, president and chairman of the board, National Wildlife Federation, Washington. Samuel B. Morris, general manager and chief engineer, department of water and power, Los Angeles. Charles A. Sprague, editor and publisher of the Oregon Statesman, Salem. Chairman of subsection A, Supply, Use and Competitive Demand: Thorndike Saville, dean of the college of engineering, New York University. Chairman of Subsection B—Division of Responsibilities among Private Groups and Various Levels of Government: W. S. Rosecrans, chairman, California State Board of Forestry. Chairman of Subsection C—Evaluation and Reimbursement: M. M. Kelso, dean of agriculture, Montana State College. Rapporteurs: Section III—Maynard M. Hufschmidt, Technical Review Staff, Office of the Secretary, Department of the Interior. Subsection A: Stephen W. Bergen, the Conservative Foundation. Subsection B: Howard L. Cook, Office of the Chief Engineers, Corps of Engineers, Department of the Army. Subsection C: Melvin E. Scheidt, Resources and Civil Works Division, Bureau of the Budget. Assistant to the section chairman: Perry R. Taylor, Assistant to the Chief, Division of Water Pollution Control, United States Public Health Service. Section consultant: Russell Lord, editor, the Land. Steering Committe Assistants: Henry Erlanger, Resources and Civil Works Division, Bureau of the Budget. Howard E. Ball, Resources and Civil Works Division, Bureau of the Budget.

IV. Domestic problems of nonfuel minerals

Chairman: Evan Just, vice president, Cyprus Mines Corp., New York. Cochairman: John Vanderwilt, president, Colorado School of Mines. Steering committee: Christopher M. Granger, formerly Assistant Chief, United States Forest Service, Washington, D. C. Robert Koenig, president, Cerro de Pasco Corp., New York. Harold F. Mills, manager, Iron King Branch of Shattuck Denn Mining Corp., Humboldt, Ariz. Donald Montgomery, chief of the Washington office, United Auto Workers, CIO. W. M. Peirce, technical assistant, New Jersey Zinc Co., New York. Philip J. Shenon, consulting geologist, Salt Lake City. Louis Ware, president, International Minerals & Chemical Corp., Chicago. Norman J. Dunbeck (alternate for Mr. Ware), vice president, Industrial Minerals Division, International Minerals & Chemical Corp. Howard I. Young, president, American Zinc, Lead & Smelting Co., St. Louis. Chairman of Subsection A—Tax Incentives: Evan Just. Chairman of Subsection B—New Technology: John Vanderwilt. Subsection C—The Claim-Patent System. Subsection D—The Government Role in Furthering Mineral Exploration, Development, and Production: Rapporteurs: Section IV: Robert H. Ramsey, editor, Engineering and Mining Journal. Howard L. Waldron, Mining World. Assistants to the Section Chairman: S. G. Lasky, Technical Review Staff, Office of the Secretary, Department of the Interior. Bruce C. Netschert, Materials Office, Office of Defense Mobilization.

V. Energy resource problems

Chairman: Farrington Daniels, chairman, department of chemistry, University of Wisconsin. Cochairman: George M. Gadsby, president, Utah Power & Light Co., Salt Lake City. Steering committee: Austin Cadle, economist, Standard Oil Co. of California, San Francisco. S. R. Finley, general superintendent, Electric Power Board, Chattanooga. H. C. Hottel, department of chemical engineering, Massachusetts Institute of Technology. R. L. Ireland, chairman of the executive committee, Pittsburgh Consolidation Coal Co., Cleveland. Betrand A. Landry, Battelle Memorial Institute. Leonard F. McCollum, president, Continental Oil Co., Houston. C. Petrus Peterson, president, National Reclamation Association, Lincoln, Nebr. J. French Robinson, president, Consolidated Natural Gas Co., New York. Glen Wall, International Brotherhood of Electrical Workers, Washington.

Chairman of Subsection A—Unconventional Source: H. C. Hottel. Chairman of Subsection B—Electricity and Synthetic Fuels: B. R. Teare, Jr., dean, college of engineering and science, Carnegie Institute of Technology. Chairman of Subsection C—Conservation and Use: Eugene Ayres, consultant, Gulf Research & Development Co. Rapporteurs: Section V—F. G. Fassett, director of the technology press, Massachusetts Institute of Technology. Cornelius J. Dwyer, Foreign Operations Administration. Subsection A: Shelby Thompson, Atomic Energy Commission. Harold Barnett, the Rand Corp. Subsection B: Reginald Price, Office of the Assistant Secretary, Department of the Interior. William H. Snyder, Bureau of the Budget. Subsection C: Charles Scarlott, Westinghouse Electric Corp. Wilbert G. Fritz, Office of Defense Mobilization. Assistant to the section chairman: Glenn McLaughlin, economist, Export-Import Bank of Washington.

VI. United States concern with world resources

Chairman: Edward S. Mason, dean of the graduate school of public administration, Harvard University. Cochairman: E. G. Collado, assistant treasurer, Standard Oil Co. (New Jersey), New York. Steering committee: Dennis A. Fitzgerald, deputy director for operations, Foreign Operations Administration, Washington, D. C.; Stacy May, economist, International Basic Economy Corp., New York.; Morris S. Rosenthal, president, Stein, Hall & Co., New York; Stanley H. Ruttenberg, director, department of education and research, Congress of Industrial Organizations, Washington, D. C.; H. DeWitt Smith, engineering consultant, Newmont Mining Corp., New York; Simon D. Strauss, vice president, American Smelting & Refining Co., New York. Chairman of subsection A—commercial policy: Stacy May. Chairman of subsection B—investment and development: H. DeWitt Smith. Chairman of subsection C—market stabilization: Simon D. Strauss. Rapporteurs: section VI: John W. Evans, director, office of International Materials Policy, United States Department of State. Subsection A: Boyd France, foreign affairs correspondent, Washington bureau, McGraw-Hill Publishing Co. subsection B: William B. Gates, Jr., economist, Export-Import Bank of Washington. Subsection C: William T. Phillips, professor of international economics, school of advanced international studies of the Johns Hopkins University. Assistant to the section chairman: Robert Blum, consultant, Foreign Operations Administration.

VII. Problems in resources research

Chairman: Earl P. Stevenson, president, Arthur D. Little, Inc., Cambridge, Mass. Cochairman: R. E. Gibson, director, Johns Hopkins University Applied Physics Laboratory. Steering committee: Eli Ginzberg, professor of economics, graduate school of business, Columbia University. Columbus O'D. Iselin, senior physical oceanographer, Woods Hole Oceanographic Institution. Vincent Sauchelli, director of agricultural research, Davison Chemical Corp., Baltimore. Theodore Schultz, chairman, department of economics, University of Chicago. Paul B. Sears, chairman, conservation program, Yale University. William H. Stead, resource management consultant, Washington. Discussion leader: Emil Ott, director of research, Hercules Powder Co., Wilmington. Speakers: Stanley A. Cain, chairman, department of conservation, University of Michigan; R. E. Gibson; Thomas B. Nolan, Assistant Director, United States Geological Survey; Paul B. Sears; Athelstan Spilhaus, dean of engineering, University of Minnesota; Philip Sporn, president, American Gas & Electric Service Corp., New York; Paul Weiss, professor of zoology, University of Chicago. Assistant to the chairman: Robert G. Snider, vice president-director of research, the Conservation Foundation.

VIII. Patterns of cooperation

Chairman: H. Christian Sonne, chairman of the board, Amsinck, Sonne & Co., New York. Cochairman: Luther Gulick, president, Institute of Public Administration, New York. Steering committee: Edwin R. Cotton, president, American Watershed Council, Inc., Washington; Karl T. Frederick, vice president, National Wildlife Federation, New York; John E. Ivey, Jr., director, Southern Regional Education Board, Atlanta; Clyde S. Martin, forest counsel, Weyerhaeuser Timber Co., Tacoma; Bernard L. Orell (alternate for Mr. Martin), vice president, Weyerhaeuser Sales Co., St. Poul; Lithgow Osborne, vice president, Auburn Publishing Co., Auburn, N. Y.; Matt Triggs, assistant legislative director, American Farm Bureau Federation, Washington; Frederick L. Zimmerman, research director, New York Joint Legislative Committee on Interstate

Cooperation. Discussion Leader of session A—cooperation at the grass roots: Edwin R. Cotton. Discussion leader of session B—wider bases of cooperation: Charles R. McKinley, professor of political science, Reed College. Discussion leader of session C—taking full advantage of research: John E. Ivey, Jr. Discussion leader of section D—the summing up: Luther Gulick. Rapporteurs: Theodore Geiger, director of research, National Planning Association; Laurin L. Henry, staff assistant, Public Administration Clearing House; John C. Honey, staff assistant, program analysis office, National Science Foundation; Robert N. Hoskins, industrial forester, Seaboard Air Line Railroad Co.; Raymond F. Howes, staff associate, American Council on Education; John W. Lehman, clerk, Joint Committee on the Economic Report, United States Congress; J. Victor Skiff, deputy commissioner, New York State Department of Conservation. Assistant to the section chairman: Joseph L. Fisher, associate director, Resources for the Future, Inc.

CONFERENCE AGENDA

Wednesday, December ?

General session

Welcome: Lewis W. Douglas, chairman of the conference.

The conference schedule: Norvell W. Page, director of the conference.

A midcentury look at resources: Roundtable discussion. Chairman: Robert D. Calkins, president of the Brookings Institution. Discussors: James Boyd, exploration manager, Kennecott Copper Corp.; Theodore Schultz, chairman, department of economics, University of Chicago; Earl P. Stevenson, president, Arthur D. Little, Inc.

Luncheon

President Eisenhower will greet luncheon guests.

The purpose of the conference: Presiding: Lewis W. Douglas, chairman of the conference.

First meetings of conference sections

Sections I, II, III, and IV will break up into their subsections during the afternoon. Location of subsection meeting rooms is tentative. Final disposition of subsection meeting rooms will depende upon final subsection attendance.

I. Competing demands for use of land
   - A—Urban land
   - B—Rural land

II. Utilization and development of land resources
   - A—Food and nonwood fibers
   - B—Timber and wood products
   - C—Wildlife, scenic, wilderness, and other recreational areas
   - D—Watershed values

III. Water resource problems
   - A—Supply, use, and competitive demand
   - B—Division of responsibilities among private groups and various levels of government
   - C—Evaluation and reimbursement

IV. Domestic problems of nonfuel minerals
   - A—Tax incentives
   - B—New technology
   - C—The claim-patent system
   - D—The Government role

V. Energy resource problems
   - A—Unconventional sources
   - B—Electricity and synthetic fuels
   - C—Conservation and use

VI. United States concern with world resources
   - A—Commercial policy
   - B—Investment and development
   - C—Market stabilization

VII. Problems in resources research

VIII. Patterns of cooperation

Dinner

The Public Lands—Who Should Control Them? Presiding: Lewis Webster Jones, vice chairman of the conference. Toastmaster: Horace M. Albright,

chairman of the board of directors, Resources for the Future, Inc. Speakers: Judge Robert W. Sawyer; the Honorable Wesley A. D'Ewart, Representative from Montana.

Thursday, December 3

Second meetings of conference Sections

Sections I, II, III, V, and VI will meet in subsections. Sections IV, VII, and VI will meet as sections. See rooms indicated on opposite page.

Luncheon

Informal group luncheons can be arranged through consultation with the conference manager before 10 a. m.

Third meetings of conference sections

Sections and subsections will continue to meet as in the morning.

Dinner

How Much Should We Depend on Foreign Resources? Presiding: Herman W. Steinkraus, vice chairman of the conference. Speakers: Charles P. Taft, president of the Committee for a National Trade Policy; Andrew Fletcher, president, St. Joseph Lead Co.; Robert Garner, vice president, International Bank for Reconstruction and Development.

Friday, December 4

Final meetings of conference sections

All sections will meet as sections in rooms indicated on opposite page.

Luncheon

Resources for the Future, Inc.—What It Is; Its Plans. Presiding: Karl T. Compton, vice chairman of the conference. Speaker: Reuben G. Gustavson, president and executive director, Resources for the Future, Inc.

General session

Presentation of section reports. Presiding: Lewis W. Douglas, chairman of the conference.

COUNCIL OF SPONSORS

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Harry Bartell, National Association of County Officials
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Claude D. Kelley, National Wildlife Federation
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Clyde Williams, Battelle Memorial Institute

THE OFFICERS

Conference Chairman: Lewis W. Douglas, chairman of the board, Mutual Life Insurance Co. of New York.
Vice Chairmen:
Herman W. Steinkraus, president, Bridgeport Brass Co.
Karl T. Compton, chairman of the corporation, Massachusetts Institute of Technology
Lewis Webster Jones, president, Rutgers University
Director: Norvell W. Page
Counsel: Samuel H. Ordway, Jr., executive vice president, the Conservation Foundation
Conference Steering Committee:
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Ira Gabrielson, Wildlife Management Institute
Margaret Hickey, National Federation of Business and Professional Women's Clubs and Ladies Home Journal
James R. Killian, Jr., Massachusetts Institute of Technology
Allan B. Kline, American Farm Bureau Federation
Robert Koenig, Cerro dePasco Corp.
James Madden, Hollingsworth & Whitney Co.
William R. Mathews, Arizona Daily Star
Albert Mitchell, T. E. Mitchell and Son Cattle Ranch
Lloyd E. Partain, the Curtis Publishing Co.
Boris Shishkin, American Federation of Labor
Anthony Smith, Congress of Industrial Organizations
H. DeWitt Smith, Newmont Mining Corp.
H. Christian Sonne, National Planning Association and Amsinck, Sonne & Co.
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John R. Suman, American Petroleum Institute and Standard Oil Co. of New Jersey
Abel Wolman, Johns Hopkins University
Ex officio members:
Horace M. Albright, chairman of the board, Resources for the Future, Inc.
R. G. Gustavson, president and executive director, Resources for the Future, Inc.

Resources for the Future, Inc., board of directors

Horace M. Albright, chairman; Reuben G. Gustavson, president and executive director; Edward J. Condon; Otto H. Liebers; E. B. MacNaughton; Leslie A. Miller; Fairfield Osborn; William S. Paley; Beardsley Ruml; Stanley Ruttenberg.

THE STAFF

Assistant conference director, Henry Jarrett; administrative officer, Vera W. Dodds.

Section assistants: Section I, Nora E. Roots; Section II, Weldon A. Stein; Section III, Russell Lord; Section IV, Samuel Botsford; Section V, Charles Schwarz; Section VI, Myer Rashish; Section VII, Francis T. Christy, Jr.; Section VIII, Kathryn S. Arnow.

Administrative staff: Conference manager, Michael A. Stahl; assistant conference manager, Dorothy H. King; order of the day, Lloyd W. Thorsen, Elaine D. Bronez; information, Constance C. Johnson; registration, Ethel M. Quee;

document's officer, Mary J. Gordon; documents production, Marietta Schirf, Ellen H. Ryan.

Press officers: William E. Hughes, D. Shannon Allen, William F. Frye, Jennie M. Johnson, administrative assistant.

[Petroleum Press Service, January 1954]

U. S. A.: The Needs of Tomorrow

Inspired by the Paley Commission's report a recent high-level conference in Washington, the Midcentury Conference on Resources for the Future, has reexamined the prospects for future energy and raw material supplies to meet the continuing rapid increases in consumption by the United States and the needs of other countries of the free world. By 1975 the United States output of goods and services may have risen to about 2½ times its present level, and her energy needs will probably rise at a similar pace, a situation which is given special significance by her inevitably growing dependence, in the longer term, upon overseas sources of raw materials and oil supplies.

As the United States continues to consume each year a high and growing proportion of the raw material and energy supplies of the free world the need to reassess the prospects for future supplies becomes more pressing. In the continuous pursuit of higher living standards for its rapidly growing population—increasing today by about 3 million people or 2 percent each year, a faster rate of increase than in India—the United States has used up since 1900 more than 40,000 million barrels of oil, 26,000 million tons of coal, 3,000 million tons of iron ore, and huge amounts of nonferrous metals. Today, with less than 10 percent of the population and of the land area of the free world, the United States is consuming two-thirds of the oil, a similar proportion of the rubber, and about half of the total of a wide range of metallic ores consumed by all free countries taken together. The United States still has an enormous wealth of natural resources within her own borders, but the continuing sharp increases in consumption and the country's growing dependence on imports from other countries have given rise to growing concern over the availability and costs of future supplies.

Inspired by the report of the United States President's Materials Policy Commission (the Paley report—see Petroleum Press Service, September 1952, pp. 305, 313), a 3-day conference of high-level representatives from the business, scientific, academic, and other spheres in the United States, together with a number of foreign observers, undertook in Washington last month an exploratory examination of the vital problems posed by the mounting size of the United States future raw material and energy requirements. To the oil industry at large the deliberations of the conference [1]—whose objectives have been publicly endorsed by President Eisenhower—are of great interest, both in their concern with the pace of future economic growth and in their direct consideration of future energy needs and supplies.

United States production of goods and services may increase within the next 10 years by as much as 75 percent to reach a total (at today's prices) of some $500 billion, according to a paper prepared as a basis for conference discussion by the Brookings Institution (a nonprofit body researching into economics and government). This extraordinary economic growth may be followed by a further gain of about 50 percent to reach $750 billion in 1975. Underlying these gains will be an increase in United States population by at least 25 percent to a total of about 200 million people in 1975. From the mid-1960's a greater proportion of the United States population—representing the high birthrates of the immediate postwar years—will become potential purchasers of cars, houses, and the rest of the vast range of consumer goods demanded by the American consumer. Despite the high average standards of living already attained in the United States, scope for considerable further economic advancement still remains. According to a recent statement by the Council of Economic Advisers to the United States President, one-quarter of United States families have incomes of

[1] The Midcentury Conference was sponsored by a nonprofit research body, Resources for the Future, Inc., and financed by the Ford Foundation.

less than $2,000 a year, and it is feasible within only 10 years to raise all these incomes to at least $4,000. An essential foundation for the astonishing rate of growth indicated by the above figures will be continuing sharp increases in United States productivity (or output per hour of human effort). Thus, it is anticipated by the Brookings Institution's paper that there will be an average annual gain of 3 percent in United States productivity during the next two decades. This rate of productivity increase will spring in large part from the readiness of United States workers and management to introduce innovations made possible by technological advances. By no means out of line with the annual average gain of 4 percent in productivity which has held in the United States since the low point of 1933, it is however considerably higher than the United States average of 2.1 percent over the longer term from 1910 to 1949.

The enormous strides forseen in United States production and consumption will demand continuing rapid increases in the country's supplies of raw materials and energy. The new demands which will be made on the free world's resources will be added the expanding needs of other countries which, in the case of oil, are growing at an even faster rate than in the United States. Accompanying the increase of 100 percent in United States general production between 1950 and 1975 forecast by the Paley Commission Report (which assumed a considerably slower rate of economic growth than forseen in the Brookings Institute's paper), it was anticipated that an increase in material and energy consumption would be required by about 50 to 60 percent. The slower growth expected in requirements of material resources than in the output of goods and services is accounted for in part by the growing importance of nonmaterial services in total national consumption coupled with the possibility that future gains in living standards will take the form or more leisure activity rather than of a greater consumption of material goods. However, in respect of energy the Paley Commission forecast that the doubling of United States production of goods and services would require a doubling also of energy consumption (in part, perhaps, because many services such as heating, cooling, and transport, and in particular the leisure-time use of the private car, are important spheres of energy consumption). It is evident that an enormous increase in United States oil and total energy requirements is in prospect, perhaps to 2½ times the present level by 1975.

The United States has already gone further than any other country in supplementing human effort with mechanical energy, of which it has abundant supplies. Thus, whereas at the beginning of the century more work was done in the United States by men and animals than by mechanically-operated equipment, today the energy derived from mineral fuels and hydropower does 95 percent of all work. Consumption of energy per head in the United States of America is equivalent to about 8 tons of coal per year, against an average of about 1½ tons for the world as a whole, and 4 tons in even so highly industralized a community as the United Kingdom. Since 1926, while coal output in the United States has dropped by one-quarter, oil production has more than trebled, natural gas production has been multiplied sixfold, and hydropower, though still very small in total, has doubled. Today, oil (including substantial imports) supplies about two-fifths and natural gas rather more than one-fifth of the United States total energy needs.

Looking ahead, the Paley Commission report forecast total United States energy requirements in 1975 at 2,600 million short tons of coal-equivalent fuels. By that date oil consumption was expected to reach 13.7 million barrels per day, of which about 2.5 million barrels per day would be supplied by net imports, and the rest by domestic production of natural and synthetic liquid fuels. The production of natural gas was forecast to increase to 15 million million cubic feet a year or roughtly twice the present level. The proportionate contributions of oil and natural gas to United States total energy supplies were thus expected to remain at roughly the same level as today, viz, two-fifths and over one-fifth respectively.

Further analysis of the Paley report's forecasts, facilitated by a reassembly of them in a paper presented to the recent conference (prepared by a committee of business, university and other representatives), throws interesting light on the subject of efficiency in United States energy use. By 1975 it is foreseen that as much as two-thirds of the United States' total energy consumption will be in the form of secondary energy products, viz, liquid fuels, electricity, and coke (the figure in 1947 was 57 percent). The energy lost in the process of converting primary energy sources into these secondary forms will then amount—as it also does today—to no less than one-third of the total energy consumed. But this figure

excludes the enormous further losses incurred through the inefficient use of the energy liberated at the point of final consumption. Thus it is indicated that overall in the United States today only 15 to 20 percent of all energy resources consumed is put to effective use. Great strides have, however, already been made in improving the efficiency of energy production and use. In the field of electric power production, for example, an output of 1 kilowatt-hour is obtained in the United States today by burning less than 1 pound of coal, whereas a generation ago 2 to 3 pounds of coal were required (in the United Kingdom, where the rapid prewar improvements in generating efficiency have been halted in recent years, 1.7 pounds of coal were consumed in 1952 for each unit of electricity generated). Even more striking is the fact that in all fields of United States energy use taken together the average consumption of primary energy resources per head of the population advanced only a few percent in the 30-year period 1917–47, while the work performed increased by no less than 260 percent. As is clear from the above figures, however, substantial scope still remains for further improvements in the efficiency of both energy production and energy use.

Whatever measures may be taken by the United States to increase the indigenous production of raw materials and energy products or of synthetic substitutes for them, it is inevitable that a growing reliance be placed on imports—of oil as of other commodities—from other countries. Apart from the long-term issues raised by this development the conference considered the desirability of the existing United States policy of stockpiling strategic materials which in the event of war would be required in large volumes from overseas. (In the case of oil, of course, owing to the prohibitive size and cost of the storage capacity necessary to provide against the possible interruption of war-time overseas supplies, the alternative to imports is not stockpialing but the creation now within the United States of reserve productive capacity.) The question was posed whether the novel character of atomic warfare might reduce the relative importance of the risk from attacks on shipping while giving rise to a new and greater risk that industrial, commercial, and transport facilities in the United States itself may be destroyed. Should this be the case it might be considered that a greater dispersion of materials and energy supply sources would be the most advisable course.

Synthetic materials may in many instances provide a valuable additional source of supplies for both war and peacetime consumption in the United States. In the case of liquid fuels, however, any early resort to synthetic sources of supply—including in this term liquid fuels from shale, from coal and from tar sands—would, it was indicated by the conference paper on energy, require governmental assistance either in the shape of public investment or by the setting of prices high enough to cover the greater costs of production. Oil production from shale, which is likely to be the earliest economic substitute for natural petroleum, might, it was suggested in another conference paper, qualify for protection against imports in order to build it up as an "infant industry." The tar sands also represent a significant potential source of liquid fuels, and in particular the large Athabasca reserves in Canada may at some future date assume great importance for the United States market.

Prospects for the peacetime use of nuclear power, lately much in the public eye, were also touched upon during the recent conference. An interesting aspect of the possible future peacetime use of atomic power is the greater dependence upon electricity which would probably follow. This would imply, it was pointed out in a conference paper, either that much of the heating, transport, and industrial use of energy would have to take the form of electricity, or alternatively that other fuels previously used for electricity generation would be displaced by nuclear fuel and be available in increased quantities for other uses. On solar energy the conference paper commented that it is no more than prudent to devote a reasonable amount of current research to the harnessing of this vast potential energy source, but that no method of utilization yet proposed is even on the threshold of being economical for large-scale installations.

The recent conference—which has led to plans for continuing research into many of the problems raised—was notable for the evidence which it gave that an important body of United States opinion is continuing to grapple vigorously with the longer-term problems of materials and energy supply. At a time when the short-term advantages of increased restrictions on United States imports, particularly imports of oil, are being actively canvassed in Congressional and other circles it is significant, to say the least, that forward-looking attention is simultaneously being given to the full and far-reaching implications of the inevitably growing dependence by the United States, in the long-term, on overseas sources of raw materials and oil supplies.

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